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ABSTRACT

This document contains 47 selected papers from the 1995 International Visual Literacy Association (IVLA) conference. Topics include: the cultural significance of tombstone iconography; the predicted impact of multimedia on education and entertainment; the effects of digital imaging on the art of photography; visual representation of the structure of the Internet; the semiotics of World Wide Web homepage icons; anthropomorphizing the user interface; graphic organizers for teaching literacy strategies to at-risk students; visual aids in food safety education; visually translating educational materials for ethnic populations; visual representations of student assessment; the impact of cover art in young adult books; effects of computer visual appeal on motivation in learning; design issues in instructional virtual environments; the aesthetic-emotional response to media at odds with principles of critical viewing; impact of cognitive aspects of human-computer interaction on application design; visual aids and elementary creative writing; women in cyberspace; educational holograms; image maps on the World Wide Web; lessons learned in the development of an interactive multimedia CD-ROM; adaptation of a visual readability instrument to multimedia materials; instruction with digital photography; and electronic performance support systems; what teachers should know to teach students to author hypermedia; formative evaluation and World Wide Web hypermedia; computer animation in the English as a Foreign Language (EFL) learning environments; and using visuals to develop a reading vocabulary. (BEW)

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Eyes on the Future:
Converging Images, Ideas and Instruction

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Selected Readings Edited by

Robert E. Griffin
Darrell G. Beauchamp
J. Mark Hunter
Carole B. Schiffman

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Selected Readings of the
International Visual Literacy Association
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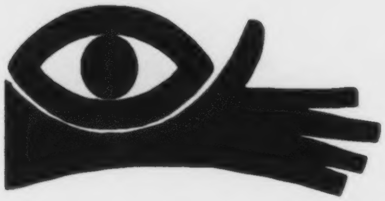
ABOUT THE COVER

The cover for this book had an interesting evolution. We began with several ideas and designs but, what we finally decided to use was so clean that it was too simple. My students, who are all MBA students in the Smeal College of Business Administration, remarked on the uniqueness of the IVLA logo and convinced me that it alone should make up the cover. Maybe for the first and only time we have a cover design developed by business students. You see, IVLA is an organization that attracts all kinds of people.

My thanks go to Anna Jane Rishel, Cathy Kennedy and Docie McCormick in the Penn State Center For Business Graphics for carrying out the design and formatting it for the cover. You do great work!



ACKNOWLEDGMENTS

An exciting project is finally coming to an end. The project began on a Saturday morning in Chicago at a 7:00 AM breakfast ("Bob...why do you schedule meetings for breakfast?"). I met with the other three editors and we passed out portfolios of papers. We each walked away from that meeting with over 50 papers. I didn't really grasp it at the time, but my work was only beginning.

Time passed too quickly with readings, corrections, phone calls and discussions with authors and printers. I noted yesterday, as I received the last of the completed papers, that it's funny how you get on a first name basis with the Federal Express and UPS delivery people. But ...somehow it all gets done. My real moment of happiness will be when this parcel is finally mailed to the printer.

There are many people who must be thanked for their efforts. One thousand IVLA accolades need to be give to my co-editors, Carole Schiffman, Darrel Beauchamp and Mark Hunter. Their effort in reading and commenting on papers will be obvious from the quality of the papers assembled in this book. Not all of the papers submitted made it through their scrutiny, their desire for the best made this publication come true. They were always there when I needed help.

I also want to thank my staff assistant, Bob Miller, for helping to coordinate the work of the publication. He was there to send the edited copies back to the authors, answer your calls and coordinate the final publication. He just began working for Penn State in September, so he stood the test of fire.

Also to be thanked is the Papers Committee at Northern Illinois University. The conference that generated these papers was sponsored by their university. They did an excellent job of the original screening of the papers that are in this publication.

I also want to thank my University, Penn State, and the Deans of the Smeal College of Business Administration, J.D. Hammond and Pete Bennett, for their support in making this publication possible. Their willingness to provide the time and equipment for me to complete this assignment is appreciated.

There is one other person who held my hand through my first year as editor, Tom Wagner of Omni Press. Tom's willingness to answer stupid questions and to get this thing to press made my job a lot easier.

Finally, as an editor I must thank those who really allowed this publication to happen, my family. They were the ones who stayed off the computer while I was working, kept the coffee pot going and generally let me get my work done. I want to thank my wife Wheez and kids Rob, Ted, Big A and Alie for all of their support.

Robert E. Griffin
State College, Pennsylvania
December 19, 1995

PREFACE

As the new editor of the Readings, I am excited about delivering a high quality collection of important readings to you. Included in this book is the work of over 70 authors and the review of 4 editors. We all hope that our efforts are of value to you.

A new feature in the Readings this year is the Editors' Choice Award. When the Editors met for their kick-off meeting, one of my instructions to them was to note the papers that they felt were "the best" of the lot. Each editor was allowed to nominate 5 papers to this ranking. I hoped that if each of the Editors nominated 5, a winner might emerge. I wasn't really sure the process would work, but it was worth a try. The unanimous winner was the paper titled **Life Visions for the Future: Converging Ideas and Images from Sepulchral Visuals** by John Cochenour and Landra Rezabek. This paper is showcased as the first paper in the book and is designated the winner with the new Editors' Choice symbol. Be sure that you take time to read this wonderful paper. Cochenour and Rezabek's paper epitomizes the value of this book and IVLA in general.

I have not attempted to catagorize or rank or order the way the papers are presented in this book, save the first place position of the Editors' Choice. I tried to...but I couldn't settle on any major categories. Every time I picked four categories, I wanted to take papers and move them into another pile. The only category that consistently emerged was the World Wide Web. Had I classified the papers, this would have been a large category. The reason I chose not to attempt to categorize the papers was that even the papers that I would have put in the Web category were about other topics. For example, several Web papers are really about visual design. Therefore I have left you with a random assignment of papers. No where else will you find such a complete collection of work and research in the area of visual literacy. This book is filled with the best current ideas the field has to offer. I present the papers to you for your enjoyment. Enjoy the read!

We all hope that you enjoy this book and that its words and pictures guide you all to new heights. May the work shown here contribute to the future.

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Editors' Choice

Life Visions for the Future: Converging Ideas and Images from Sepulchral Visuals

John J. Cochenour & Landra L. Rezabek

Introduction

Augustine theorized that a fire existed within each person and that this fire was collected with intensity behind the eyes. In order to see something, the eye projected the fire in the form of an invisible ray that focused upon the object of interest. A two-way connection was formed that allowed the attention and energy of the viewer to pass to this object and a representation of the object to be returned to the eye. This representation was bonded to the soul of the viewer and therefore could be recalled or remembered. The dilemma for the viewer was the belief that looking at negative or dangerous things could contaminate the soul; however, viewing positive or miraculous objects could be healing to the soul (Miles, 1983). Although this theory is no longer ascribed to as an explanation for the way the eye functions, it is useful when considering historical images and symbols to remember the impact and deep emotion attached to visuals.

Many historical and traditional symbols are recorded in cemeteries. In a manner of speaking, the images found on cemetery markers carry a visual glimpse of a person's life and the culture surrounding that life. It is very difficult to create a single visual to portray the complex meaning of a life and death, and a variety of attempts are evidenced in even the smallest graveyard. Tombstones, therefore, are important cultural indicators that profile individual lives and contemporary expression (Norris, 1988). The symbols and motifs in cemeteries convey information regarding a society's order, values, and realities at the time of an individual's death. Whether the symbols are secular or religious in nature they are imbued with fundamental ideas, emotions, and memories (Miles, 1985). This study represents a beginning effort to investigate the historical, social, and personal importance and meanings of sepulchral visuals.

Rationale and Questions

The cemetery or burial ground is a remarkable source of information regarding the society it represents. Burial grounds have undergone their own development throughout civilization and changes in a society are reflected by the treatment of the dead. There has been particularly close association between a society's religious practices and the nature and appearance of their cemeteries. Many early religious and secular practices regarding the treatment of the dead persist in symbolic form on tombstones. For example, during the sixth to eighth centuries it was common to light fires, called "lanterns for the dead" (Aries, 1985, p. 18), near tombs to keep away the unquiet dead. It is easy to imagine that many of the visual representations of candles, torches, and flames found on contemporary tombstones might trace a portion of their history back to this practice.

In addition to symbols that can be linked to current life or past customs, other sepulchral visuals may have no meaning for contemporary society. Still other symbols have so many meanings that it is difficult to suggest a standard interpretation. Some of the symbols on headstones are actually decorations that have been chosen because of personal preference, appearance, engraver's skill, or marketing. Some of the symbols identify the deceased, some are an invitation to meditate, some have meaning only to close friends or family, and some are directed at the passing stranger. Regardless, cemeteries offer a vast source of visual imagery that has been and continues to be intriguing, delightful, sorrowful, uplifting, humorous, and mystifying.

The primary goals of this research effort were to identify a variety of visuals found on tombstones, to look for patterns and categories of use, and to attempt to ascertain traditional, societal meanings of these icons. A follow-up question not addressed in this paper, though underlying the collection of the data, is to determine which, if any, sepulchral visuals appear to maintain an established meaning across time and culture. This paper is very much to be considered research in progress and the data have raised more questions than they have provided answers. In addition, data are extremely limited in scope. However, it is an intriguing pursuit to investigate "timeless" images that may endure in meaning and speak to future generations from the grave.

Data Collection and Analysis Procedures

Headstones began to appear for common people during the seventeenth century and this study includes gravestone dates ranging from 1666 to 1995. The sampling was very subjective and was based upon availability and time. Data collection entailed visiting 26 cemeteries in five states and three countries. In Scotland, seven cemeteries were examined, and in England, five were examined. In the United States, the data collection included five cemeteries in Colorado, three in New Mexico, three in New York, one in Oklahoma, and three in Wyoming.

Data typically were collected by a two-person research team. One investigator kept a set of field notes while the other took pictures of the visuals and analyzed the headstone. When a researcher collected data alone, both of these tasks were completed by a single person. Selection of symbols and motifs to be recorded was subjective, but researchers' judgment was tempered by readings in the literature and by collective experience as more and more cemeteries were visited. The smaller cemeteries were examined completely, but several of the largest required a sampling collected from the oldest to newest sections.

The sepulchral symbols were then analyzed and grouped into seven different major categories: humanoid forms, flora, fauna, shapes/symbols, tools/implements, scenes, and insignia. Within these broad categories over fifty subclassifications were established in order to place symbols in meaningful groups for examining similarities, trends, and other characteristics. At the time this paper was written, over 475 different grave symbols had been recorded.

Results

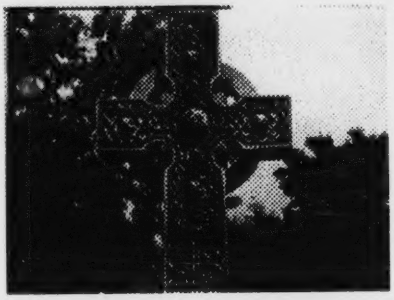
Generally, the symbols found in cemeteries mourn death, celebrate life, attest to a religious belief, and/or present a specific memory or characterization of the deceased. However, there also are occurrences of humor as well as elements of mystery regarding the stones and their symbols. An arbitrary decision was made concerning which of the symbols to discuss in this paper within the limitations of space and time. An attempt was made to represent some of the more significant and interesting symbols collected during this study. The following sections identify each of the major categories of visuals, present a general description of a specific symbol within that category including some of the traditional meanings, and discuss descriptive data and sample visuals collected during the field research.

Shapes/symbols: Crosses

The cross as a symbol dates from the earliest ages and is one of the most basic images (Liungman, 1991; Chevalier & Gheerbrant, 1994). The cross has a number of varying meanings including the number 4 (four points of the compass, four elements, and others), the earth, and a linking or channel of communication (Liungman, 1991; Chevalier & Gheerbrant, 1994). The cross, whether with arms of equal length, +, and referred to as the Greek cross, or with an elongated base, †, and referred to as a Latin cross, is most closely associated with the Western world and appears on numerous national flags (Liungman, 1991). Since the rule of Constantine and the legend of his vision of the cross, over 400 variations of the cross have been associated with Christianity, and the cross is the universally recognized symbol of that faith (Child, & Colles, 1971). As a symbol associated with cemeteries and death, the cross dates back to the seventh century and today is commonly interpreted as a symbol of death when presented with a person's name (Aries, 1985).

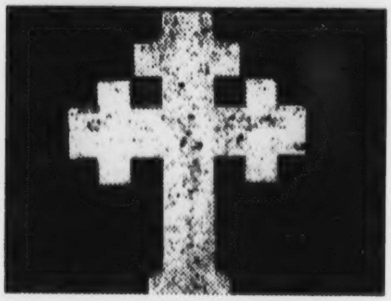
A large number of crosses were noted during this research. In fact, twenty-three percent of the pictures taken at this point in the study have included crosses, and by far, it has been the most frequently used symbol in the cemeteries visited by the researchers. Latin and Greek crosses were most frequently noted, but one of the more popular and elegant crosses was the Celtic cross, also known as the cross of Iona or the Irish cross. It is normally constructed of stone, and the circle around the crucial point was probably a practical necessity to keep the arms from breaking. Tradition holds that the circle, the emblem of eternity, suggests the everlasting quality of Christian Redemption (West, 1989; Griffith, 1966). Figure 1 is the upper portion of a Celtic cross found at Riverside Cemetery in Rochester, New York, and dates from 1879. The Celtic knots and spirals are a

Figure 1
Celtic Cross



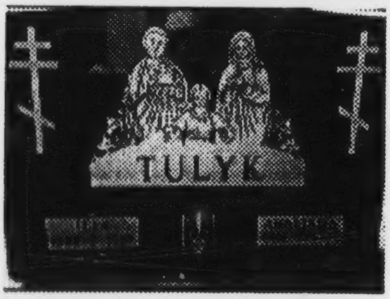
Editors' Choice

Figure 2
CROSS CROSSLET



common element of such crosses. Figure 2 is a variation of the cross crosslet, four Latin crosses joined together to form a Greek cross. A form of this cross is associated with the Episcopal church (West, 1989). The stone in Figure 2, found over the grave of a male who died in 1881, is located in the Elie Parish Church cemetery in Elie, Scotland. Figure 3, from Riverside Cemetery in Rochester, New York, shows a headstone for a Russian family with the earliest death occurring in 1986. This stone has the form of the cross generally associated with the Eastern Orthodox or Russian Orthodox Church which portrays a slanting footrest and a topmost extension for placing the criminal charges or accusations (West, 1989). This stone also shows the Holy Family and, at the center bottom, a stylized descending dove.

Figure 3
EASTERN CROSS



Fauna: Doves

The meaning behind the symbolism of the dove is suggested by the bird's swiftness, grace, beauty, white feathers, gentle cooing, and social nature. Some North American Indians regarded the dove as the messenger of rebirth in a manner similar to the dove in the Judeo-Christian story of Noah. In early pagan contexts, the dove symbolized love or the pledge of love and was associated with Venus, Aphrodite, and Bacchus. The dove also came to symbolize the soul, that imperishable or vital part of the human being (Goldsmith, 1929; Chevalier & Gheerbrant, 1994). In Christian tradition, the dove represents the Holy Spirit, or the third person of the Trinity. This visual representation most frequently takes the form of the dove flying downward or descending, especially with a nimbus about its head (Griffith, 1966; Speake, 1994).

Figure 4
Descending Dove

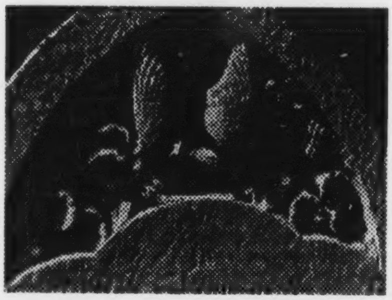
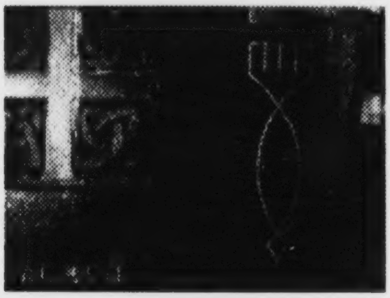


Figure 4 is a picture of a descending dove in relief at the top of a headstone from Kirkpatrick Park Cemetery in Kinross, Scotland. The dove is surrounded by several forms of flora, including ferns and roses, and is an example of the Holy Spirit symbolism. Figure 5 shows the dove flying above open gates with a branch in its

Figure 5
Dove and Gates

beak. This motif is located in Grandview Cemetery, Ft. Collins, Colorado, on a headstone with the first recorded death in 1919. It is a good example of the symbol of the dove as a messenger of rebirth or of the human soul. Figure 6 is another example of a descending dove, but in a stylized form, found on the headstone of a male who died in 1931 and who was interred in the Elie Parish Church Cemetery, Elie, Scotland.

Figure 6
Stylized Dove



Humanoid forms: Hands

Although many different representations of humanoid forms were represented on headstones, the most frequent symbol was that of the hand. This is also true in general, since the hand is the part of the human body that appears more often in symbolic form than any other (Biedermann, 1992). There are many meanings associated with the symbol of the hand which include command, royalty, justice, dominion, blessing, acceptance, friendship, strength, loyalty, prayer, and unity (Biedermann, 1992; Chevalier & Gheerbrant, 1994). The meaning varies based upon hand position, hand movement, and which hand is represented. The "Hand of Fatima" or *khamsa* from Islamic tradition is a symbol of good fortune (Liungman, 1991). Within Buddhism and Hinduism, there is a wide array of meanings for hand gestures which generally represent a polarity between the right hand, representing action, and left hand, indicating non-action and wisdom (Biedermann, 1992; Chevalier & Gheerbrant, 1994).

Most of the hand representations in this study derive from Western cultures and Judeo-Christian interpretations. In this context, the hand is the symbol of power and supremacy. The right hand is associated with blessing and the left with cursing. Various hand positions are used to indicate a blessing or benediction. The *Manus Dei* or Hand of God generally is depicted as the right hand descending from above, frequently emerging from the clouds, and rep-

Figure 7
Manus Dei

CIOUS LORD TAKE MY H

Editors' Choice

resenting creation, revelation, and redemption. When the palm of this hand is outward and the hand upright it is seen as the hand of justice. (Biedermann, 1992; Chevalier & Gheerbrant, 1994; West, 1989). The Hand of God, coupled with floral imagery, represents the Gardener plucking a "flower," or God "taking" a believer in death.

Figure 8
Manus Dei Variation

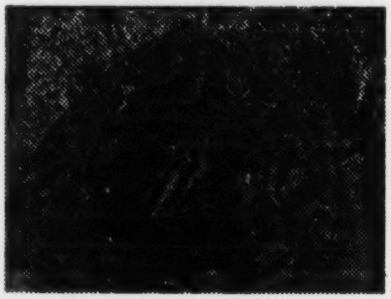
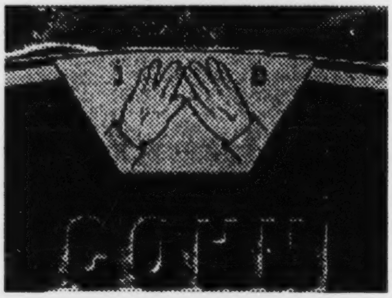


Figure 9
Grasping Hands

The hand motif in Figure 7 was taken from a stone of a man who died in 1994 and who was buried in the Greenway Cemetery in Laramie, Wyoming. It shows the *Manus Dei* emerging from the clouds to receive the deceased. Figure 8 is from the 1900 headstone of a female in York, England. It is a variation on the *Manus Dei* theme with the Hand of God reaching down to touch a human hand. A variant of this symbol is represented in Figure 9, which may be interpreted as the grasping Hand of God, presumably holding that of the deceased, an Irish born male who died in 1880 and was interred in Grandview Cemetery, Ft. Collins, Colorado. This same icon of the clasped hands also was used to represent a married couple joined after death as in life and could also represent the placing of hands into another's hands as a sign of surrender and obligation. The handshake also represents openness and acceptance. Another example of the symbolic use of hands is shown on the 1971 stone in Figure 10, found in the Mt. Hope Cemetery of Rochester, New York. Both hands raised and open with thumb and forefingers touching represents the Jewish priestly benediction (Schwartzman, 1993). Two other hand positions should be noted from their frequent reoccurrence in this study. The first is the familiar "praying hands", which was found throughout cemeteries as both a separate symbol and as a frequent position of the hands when a full human figure was represented. The other position is not one that has been explained in the literature on symbols or Christian imagery, but which is re-

Figure 10
Priestly Benediction



Editors' Choice

Figure 11
One-way Hand

ferred to as the "one-way" gesture in contemporary Christian culture. Figure 11 is a representation of this hand position and is from a female's headstone dated 1864 in Honeoye Falls, New York.

Flora: Roses

The rose was the most commonly occurring flower noted in this study, and its use in marking death has been a practice since antiquity. As a symbol, the rose has many different meanings which include rebirth or regeneration, love, passion and purity, perfection and fulfillment, blood, and spiritual power (Biedermann, 1992; Chevalier & Gheerbrant, 1994). The color of the rose often identifies the meaning behind the symbol. For example, within the Christian tradition the red rose denotes martyrdom and blood shed (West, 1989), the white rose is a legendary symbol of death (Biedermann, 1992), and within alchemy the blue rose is the symbol of the impossible (Chevalier & Gheerbrant, 1994).

Figure 12
Red Rose

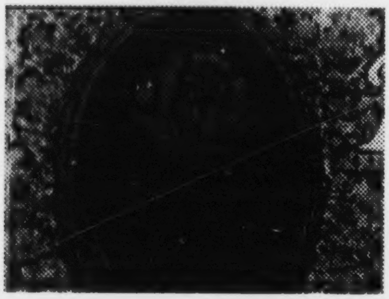


Figure 12 is a rose taken from a stone in the cemetery in Honeoye Falls, New York. The symbol was above the name of a female who died in 1985 at the age of 69. The rose was chiseled out and the blossom colored red. Figure 13 shows the rose in conjunction with the Star of David on the stone of a woman who died in 1993 and who was interred in the Mt. Hope Cemetery of Rochester, New York. Figure 14 shows a rose at the center top of a stone with a parrot on either side. This stone was in the cemetery at York, England, and belonged to a man who died in 1992. These figures are indicative of the representations of the rose symbol which often appeared alone but

Figure 13
Rose & Star of David

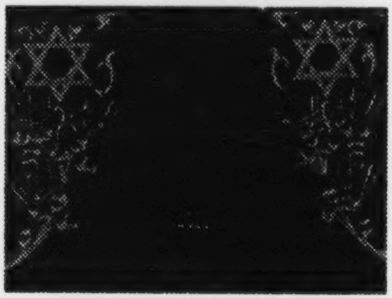
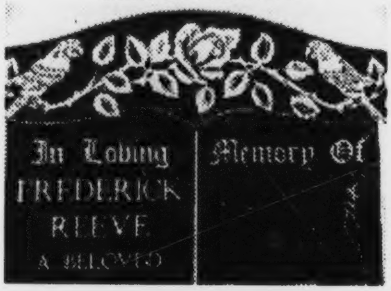


Figure 14
Rose & Parrots



Editors' Choice

commonly was joined by other symbols such as in Figures 13 and 14.

Tools/implements: Life interests

Within this classification the following symbols were included: tools representing a trade or occupation, recreational objects depicting possible activity or interest, and any other implements appearing on the stone that appeared to be used to represent the deceased's major interest or activity during life. A wide range of objects appear within this classification. This study has recorded the use of symbols to represent blacksmiths, masons, firemen, pilots, sailors, soldiers, ministers, priests, doctors, ranchers, farmers, gardeners, hunters, auto enthusiasts, bicyclists, motorcyclists, cricket players, baseball players, golfers, boaters, engineers, animal lovers, homemakers, and fishing enthusiasts. The symbols shared here represent only a small sample but they are three of the most interesting.

Figure 15
Golfer

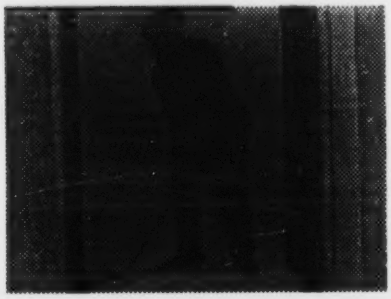
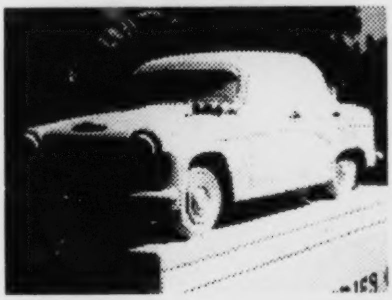


Figure 15 is the monument for Tommy Morris who was a three-time golf champion on the Old Course in St. Andrews, Scotland. The stone is located in St. Andrews Cathedral burial ground in St. Andrews. It is sculpted life-sized, mounted in a wall, and dated with his death in 1875 as a tribute from his fellow golfers. Figure 16 is the headstone for a 3 year old girl who died in 1994 that includes, among other symbols, a representation of baby footprints and a color engraving of the Barney dinosaur of cartoon television fame. This stone was located in the cemetery at Honeoye Falls, New York. The symbol in Figure 17 is a three dimensional automobile measuring almost two feet in length. This stone was in the cemetery of York, England, identifying a man who died in 1966. Figure 18 is a headstone, found in York, England, in memory of a man who died in 1990 who evidently was a person of many interests. On the headstone are engraving of flowers, crosses and arrows, a gardening shed with tools, a bus, a trailer, a dog, and a cat.

Figure 16
Barney

STEPHANIE MARIE
WHITE
1994

Figure 17
Automobile



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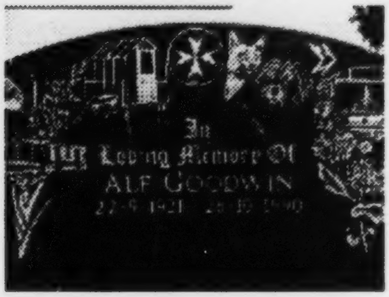
Editors' Choice

Figure 18
Life Interests



Scenes: Landscapes

Landscapes are scenic representations of the outdoors that usually take up a significant amount of space on a tombstone and provide a vista of a specific area. Seasides, mountains, deserts, and woodlands have all been noted, and other symbols such as animals, trees, objects, and buildings often are included as part of the landscape. The landscape motif seems to have greater popularity in the more modern stones and to be more prevalent in United States cemeteries than those in the United Kingdom

Some landscapes represent a specific locality and are recognizable by those who are familiar with the area. Figure 19 is in Grandview Cemetery, Ft. Collins, Colorado, and the image of nearby Horsetooth Mountain is recognizable on the stone. Figure 20 shows a landscape that is not real, but rather hoped for by the deceased or the family of the deceased. The scene depicts a heavenly mansion with a lake and swan, painted in color on whitewashed concrete. This stone is located in the Mt. Calvary Cemetery, Albuquerque, New Mexico, and is for a woman who died in 1935. Figure 21 is an example of a pastoral, quiet landscape with mountains and wildlife. This headstone also displays the Eagle Scout emblem and is located in Laramie, Wyoming,.

Figure 19
Horsetooth

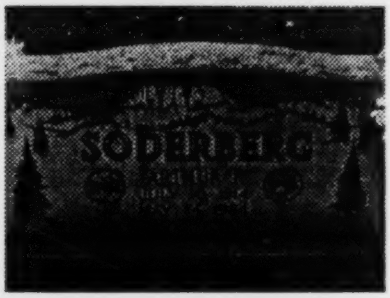


Figure 20
Heavenly Mansion

Figure 21
Scout Landscape

Insignia: Organizations

Organizations specify the meanings attributed to their icons and symbols, some-

Editors' Choice

times secretly and sometimes using commonly accepted referents. Though a number of insignia appear on headstones, the most common organizational symbols identified in this study were Masonic, perhaps since this organization originated in Scotland where a number of cemeteries were visited. Figure 22 is an example of a Masonic symbol used on a family marker in the Mt. Hope Cemetery of Rochester, New York. Figure 23, also found in Rochester, depicts the seal of the Daughters of the American Revolution. Figure 24 shows the headstone of a man buried in the Greenway Cemetery of Laramie, Wyoming, and the insignia appearing at the bottom of the stone are those of the American Legion, the Union Pacific Railroad, and the Elks (BPOE). Membership in organizations is important in defining some individuals' lives as is reflected in the use of these symbols on headstones.

Figure 22
Masonic

Figure 23
DAR

Figure 24
Descending Dove

Discussion

A variety of sepulchral visuals are found on tombstones and, in some way or another, visually represent some quality or characteristic of the deceased or the culture of the time. The original meaning of some of these symbols may have been lost or diluted over time. For example, the shape of the common pretzel, although traceable back to ancient Rome, is closely associated with Germany and Alsace where monks formed the dough into knots representing the crossed arms of a praying child. Some pretzels were made large enough to fit over the head and were worn around the neck to ward off evil spirits (Coyle, 1982; World Book, 1992).

Figure 25
THE ABRACADABRA AMULET

ABRACADABRA
ABRACADABR
ABRACADAB
ABRACADA
ABRACAD
ABRACA
ABRAC
ABRA
ABR
AB
A

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Editors' Choice

Another visual charm, the word abracadabra written downwards in triangular form as shown below, was an amulet during the Middle Ages believed to protect against various diseases (see Figure 25). The word was derived from Hebrew words meaning to strike dead with lightning, and its ninefold repetition and reverse triangular shape gave it strong celestial power (Chevalier & Gheerbrant, 1994).

Just as the meanings of these two visuals have been obscured over time, many of the symbols located in cemeteries and found on the headstones of our ancestors may no longer be representative of their intended meaning. Sepulchral visuals represent the history of people and their society, yet how many of the present generation identify the culture, traditions, and meanings associated with symbols of generations past? Are the symbols selected for use on modern headstones forging new traditions and meanings? How representative are they of current society? Have some symbols assumed such strong associations that their meanings transcend time and culture? As data continue to be collected and analyzed, these are just a few of the questions that remain to be investigated.

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FINIS

Multimedia Production: A Critical Evaluation

by Ronald E. Sutton

In the 1967 feature film, *The Graduate* , the lead character Benjamin (Dustin Hoffman), is approached by a "polyester friend" of his uptight, middle class parents. The man asks if Benjamin, a recent graduate of Harvard, wants to know what the hot--- the really hot--- product area is in the business world. Benjamin nods assent, but displays no real interest. The man is not to be dissuaded. He leans in close to Benjamin and whispers in a conspiratorial manner, "PLASTICS."

I feel somewhat the same way. My students often indicate, one way or the other, that they want to know what their focus should be in today's world of changing technologies. I often find myself, much like the polyester gentleman, saying to them, "MULTIMEDIA." This paper is a critical look at this fast-breaking, fascinating, much hyped field of multi-media. The question it asks is whether MULTIMEDIA will really be the major focus of our entertainment dollars and time in the future.

The Question of Definition

In an excellent paper, James Lockard anticipates the impact that multimedia will have in the 90's. Citing Butler (1990), and Hawn (1990), he calls multimedia "one of the hottest concepts in the computer world," suggesting it is about to overwhelm this market in "warp drive" fashion. For him "multimedia is a versatile means of communication that combines previously separate media into a single, unified computer-based entity.....computer-controlled production environments that enable creative integration and manipulation of video, audio, text, and graphic elements" (Lockard, p. 217).

In "Multimedia: Promise, Reality and Future" Mike Moore, Robert J. Myers and John K. Burton. (1994) point out the paucity of useful research on multimedia use in education. They also stress the concept of "computer driven interactivity" (p. 51). The media to be combined here include motion imagery, voices plus data, text, graphics and still images, but clearly the focus is on the intersection of video and the computer.

Ora Silverstein (1994), in her common sense article "Multimedia and Hypermedia: An Invitation for Discussion" includes "visual text, voice, picture-drawing, animation, and video" (p. 128) and wants us to focus on computer-multimedia as not only "another technology" but one that is going to play an important role in the 21st century along with all the other "multi media" we are surrounded by in today's world (p. 129).

Erik Holsinger claims in his 1994 study *How Multimedia Works* that "Multimedia has the potential to be one of the most powerful forms of communicating ideas, searching for information, and experiencing new concepts of any communications media ever developed" (p. 3). This is simply because multimedia *incorporates* every type of media ever developed.

He then describes how the multimedia experience combines all the best elements of the media we have used and developed over the years, graphic arts, books, magazines, film, animation, radio, television. He feels that's "where the real potential lies; a truly outstanding multimedia title could potentially provide an even better experience than any of the other media could individually." (p. 3) That's its potential, but not its present capability. As a matter of fact all aspects of multimedia are now inferior to the individual media at their best.

Nonetheless , *Business Week* guru Robert L. Lindstrom (1995) states "With the arrival of digital multimedia, the personal computer has crossed the threshold from the world of the static to the realm of the dynamic, where information is experienced with the senses and emotions as well as the intellect." (p. 1). Lindstrom stresses that the commonality in multimedia, other than the fact of being just another of the ways to communicate, is that all media incorporated into it is translated into digital 0s and 1s, the bits and bytes of computers. Text, graphics, audio and video are all integrated and adapted in digital form (p. 2).

Educational Revolution

There is little question that the multimedia technology has caused and is causing a revolution in education and instruction. The getting and giving of information of all kinds is being transformed both by the way the media can be integrated into one operating system as well as the interactive aspects of that system. This gives the learner or seeker considerably more control over the flow of information and instruction than he/she had previously.

This is a tidal wave of change. It will continue, hopefully with an adequate definition of what it is, and appropriate research to test its effectiveness in our school, home, office and university workplaces. For the seeking out of information, for individualized instruction of the "How to load a camera" type, for packaged instruction over long distances, for multi-path learning experiences, for quick reference and data storage and retrieval, and even for the amusement that comes from playing games on a computer, both the mundane (*Crystal Quest)* and sublime (*Myst*), multimedia is the way of the future.

Dr. Jack Jorgens, author of the text, *Shakespeare on Film (1977),* and my colleague at American University, has developed a multimedia-oriented course on his book's theme. It was done in hypercard and makes a significant sampling of Shakespearean films on laser disk available for investigation, comparison and contrast for students. It's a dynamite program and an exciting learning experience for anyone willing to engage with it in the Media Services section of American University Library.

Entertainment Evolution

But the collision Holsinger describes is "the collision of the communication, *entertainment* and computer industries" (my emphasis) (p. 2). And entertainment is the one area which will grow in an evolutionary rather than revolutionarey manner. This is predicated the firm but arguable premise that entertainment is seen economically and culturally in the United States as a social activity and not a solitary pursuit such as stamp or coin collecting.

This argument is based on a general view of the historical development of the media and its audience(s). From ancient times to the present, people have gathered together in groups large and small to watch performers in live situations. "Theater" describes this phenomenon, if by this broad and inclusive term, we mean evrything from *Medea* to *Ringling Brothers* to *Waiting for Gordot*, to *Phantom of the Opera* and all the spectacles and ritual performances in between.

From Theater to Film!!

Just one hundred years ago we began to make a transition from this sort of audience involvement in theater to that of film. We still gathered together in the relative darkness, but the performance now was frozen, canned, trapped on celluloid. We could clap or scream or laugh or cry --- and movies made us do all that---but it had absolutely no effect on the performers. They had done "their thing" many days, or weeks, or months or even years, ago and it was now immutably fixed first at 16, then later, 24 frames per second.

It really didn't even trouble us that the pictures weren't really capturing motion. This simple fact repeatedly astounds rather worldly students in university classes on visual literacy classes. Movies are a series of still photographs flashed on a screen before us and separated by snippets of darkness so that our brain is fooled into seeing motion where there is no motion.

From their invention in 1895 to the present day we enjoy the social experience of seeing a movie with our family, friends and loved ones. Sometimes whole communities gather to experience the power of this audiovisual medium when it focuses on their history or story in some special way (*Schindler's List* for example). At their peak, in the earlier decades of the 20th century, many people, including this author, went to the local movie theater(s) as many as three times a week.

From Film to TV!!!!

Then about fifty years ago we began another transition in our media entertainment. The shift to television was even more wrenching than the theater to film shift. We saw these moving images and sound in our homes for the most part, not specially built community buildings. We could look at them alone and many did and still do that; however, if taken to an extreme our society considers it anti-social behavior and dubs such persons with the unflattering label of "couch potatoes."

But in a more positive light we enjoy all manner of information and entertainment through the television medium. Two great media peaks loam large as major watersheds as we look back over the history of the media: one is the time before Gutenberg and the time after Gutenberg; another is the time without television and the time with it. These periods are increasingly referred to as he Age of the Word and the Age of the Image & Sound.

Television and its first cousin video (as in video recorder and video tapes) is enjoyed in many forms. Small and large groups gather to see athletic contests, couples enjoy movies in the privacy of their own living room, families view repeatedly their own copies of favored films, such as *The Lion King*. Television and video make up the largest element of our entertainment dollar and time commitment. In my own home the entertainment decisions are these regarding a new movie that hits

town:
Should we se it :

- A. in the theater.
- B. on a tape from Blockbusters
- C. on premium cable
- D. on broadcast television

From TV/Video to Multimedia$$$$$$$??????

Blue sky prophets talk about extravagant markets and profits to be made in multimedia. One 1990 study cited in Lockard (1991) projected "the market for multimedia worldwide to grow from $6.4 billion...to $24.1 billion in 1994, with over half of the latter in the U.S. market" (p. 218).

Another source indicates that Government analysts estimate the use of multi-media to grow from $900 in 1992 to $2.4 billion in 1995 (Couch et al p. 290).

A LINK study in 1992 predicted that multimedia revenues from business, consumer, and education will grow from $777 million in 1991 to $13 billion by 1996 (Couch et al p. 290).

A final study by Market Intelligence indicates "that the worldwide multimedia marketplace is on the brink of a seven-year explosion and is expected to peak at $424 billion in 1998" (Kupsh, p. 40) .

These are attractive figures in the business world. It's little wonder that this new media technology is receiving a full court press in hype and exaggeration. Holsinger sarcastically cites "'multimedia analysts' who announce gloriously outrageous market figures every week, in which it is certain that by the year 2000 the multimedia market will be a $650 billion industry (give or take $650 billion)" (p. 2). Reliable and credible data that really indicates the size and potential of this multimedia market is elusive to non-existent!

The Screen Dilemma

Will computers develop into large display wall screens in our homes? If so, the entertainment shift may indeed occur more rapidly than suspected or predicted, moving easily from television to multimedia with its interactive addition.

High Definition Television (HDT) could help the revolution along at this point, but presently appears stalled in competing systems and formats throughout the world.

If the basic viewing platform for multimedia remains a standard computer screen, essentially designed for individual use, then there is serious doubt it will emerge as the entertainment avalanche of the future. *Myst*, as fascinating a journey as it is, remains an individual journey, or at most a trip for two. On present screens then, multimedia entertainment is virtually impossible to conduct as a social event given its interactive nature.

CONCLUSION: IT'LL NEVER FLY, ORVILLE!!!

We need to determine, and the marketplace is doing this to some extent, what we want multimedia to do for us? Inform us, educate us, train us, play games with us, entertain us as solitary individuals....all these are possibilities, that even now move unevenly toward actuality.

But will multimedia entertain and move us as theater, film and television have in their respective Ages over the centuries. I don't think so. Serious questions can be raised about multimedia being the entertainment wave of the future. Do we really see the masses spending enormous quantities of money that would dwarf the video game industry of 3+ billion dollars (Holsinger, p. 2). Many doubt that astronomical numbers of people will spend countless, solitary hours in front of the interactive multimedia screen.

I personally doubt it will fly or float or compute! There is the possibility that I will be proven wrong . History doth occasionally make dim critics of us all. Until then, these are my questions and critical evaluation of multimedia.

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"Altered Images: The Camera, Computer, & Beyond"

Mary Stieglitz

Introduction

This discussion complements a slide presentation on the altered photographic image. Examined are the links of photographic tradition to contemporary visual imaging, the current transformation of visual imaging by the computer, and the effects of digital imaging on the visual arts.

Photography at its advent, and digital imaging over a century later, both resulted in significant transformation in visual imaging. The evolution and profusion of digital imaging have escalated the need for proficiency in analyzing visual messages. Digital imaging also increased anxiety about the verity of images. Visual literacy skills are essential as we move to a culture that is increasingly visual.

Links

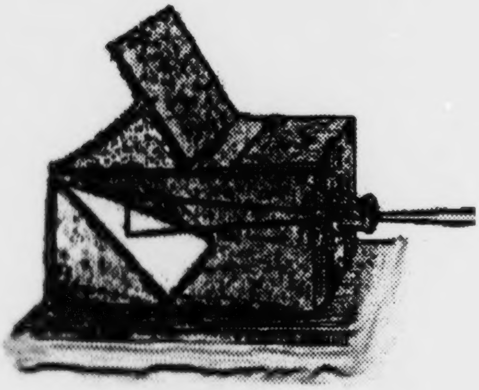
Photography stunned nineteenth century pictorial art with its ability to 'accurately' record the visual world. Now digital imaging has jolted photography's reality reference with its rapid transformations and new forms.

The wizardry of digital technology is reminiscent of the magical quality attributed to photography in its early years. Photography experienced very rapid proliferation during the nineteenth century. Coupled with the introduction of photomechanical printing processes, photography established the age of machine pictures and reproductions. The twentieth century generated a multiplicity of imaging processes, leading to computer-aided digital image systems. The links between photography and digital imaging are numerous. While different from a technical viewpoint, they share roles as vehicles of change and use of image alteration. Both experienced a repercussion to 'machine aided' art, questions about the reality of their representations, and concern about creativity. Davis (1995) paralleled their beginnings: "Modern photography was born just over a century ago from the impact of three fundamental technical innovations: the dry-plate, the hand camera, and the halftone. Now, in the 1990's, it seems evident that the computer is creating a revolution of similar magnitude in the production and dissemination of pictures."[1]

The history of imaging is a succession of systems devised to visually document and reconstruct the visible aspects of our world. Photography has a long tradition as a privileged purveyor of 'reliable' visual information. The nineteenth century commenced by believing that what was reasonable was true, and it wound up believing that what it saw in photographs was true. Photography's traditional distinction as a medium of truth is affected by digital imaging. One result is increased anxiety about the reality of images. Is photography any longer evidence of anything?

The altered image has always existed, yet computer manipulated images have generated new concern about pictorial verity. A brief probe of photographic history provides a base to consider the altered image in our current era of transition. A photographic record doesn't mean the subject exists. Photographers have been selective, malleable, and often purposefully misleading with their images.

The camera inherently produces altered images. It contracts and distorts the three dimensional world onto a two dimensional surface.



Early camera obscura. By nature, the camera compresses and delineates three dimensions onto a two dimensional surface from a particular vantage point.

Early in photography, artists combined and superimposed images, arranged scenes, added color, recorded movement and made alterations to both negative and print. The ingenuity of the photographer is unlimited in selection, composition, arrangement of subjects, camera control, darkroom manipulation, and print alteration. Altered images were produced for artistic effect, political statements, market enhancement, and pure deception. Early photography is rich with convincingly hand colored photos, spirit photos, staged scenes and combined images.

Margaret Harker Farrand (1992) examined intentions and achievements in early composite photographs. "From earliest days photographers thought of ways by which they could extend the limitations of their medium. The remarkable ability of photography to encapsulate the scene in front of the camera in minute detail on a sheet of light sensitive paper or a glass plate was sufficient for many artists to fulfil their image-making quest. For others it was too restrictive, with limitations on extent of view, spatial relationships, sequential time and movement, as well as the uniformity of emphasis on form and detail throughout the image."[2]

Developing technologies continue to blur distinctions between actual and represented reality, and alter both the technical and conceptual viewpoints of image making. Traditional notions of visual art, imaging, photography, and reality are challenged. Twentieth century visual technologies have further erased the distinction between the actual and the represented world.

The role of representing the three dimensional world has expanded with electronic tools. The development of three dimensional imaging technologies and virtual reality has altered visualization. Images manipulated by the computer further subvert the 'realism' associated with photography and invite new excursions in visualization. Both traditional photography and digital imaging re-present our visual world.

Transformation

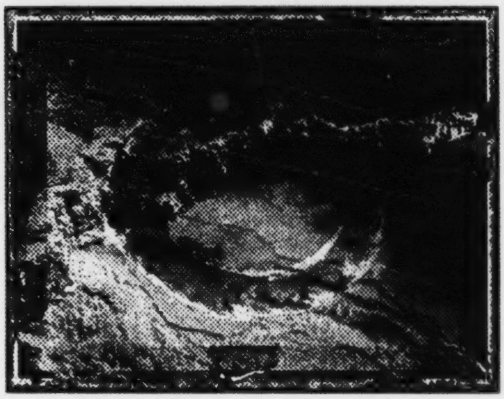
As photography transformed the visual arts, digital imaging is changing photography and visual communication. New technologies result in new tools, forms, functions, and potential for novel aesthetic constructs, both visual and conceptual. New ways of influencing perception and thought of what is real abound. Some digital art forms are accessible only through a computer, may be interactive, or exist in alternative forms. The information highway as a new vehicle of mass communication will instill debates as digital imaging becomes a global representation, just as photography did in its first 160 years.

Digital imaging encompasses a diverse array of techniques and applications, from the computer as an electronic replacement for traditional media, to the exploration of digital tools for their unique capabilities. Electronic tools offer us the ability to generate and manipulate more images, by more means than ever before.

The core of slides in this presentation offer a visual commentary ranging from historic precedents to present experiments. Examples of altered imagery are as fascinating in early photography as in contemporary work. The slides illustrate a rich repertory of artists, images and forms. The motives may seem similar, perhaps just the tools have changed.

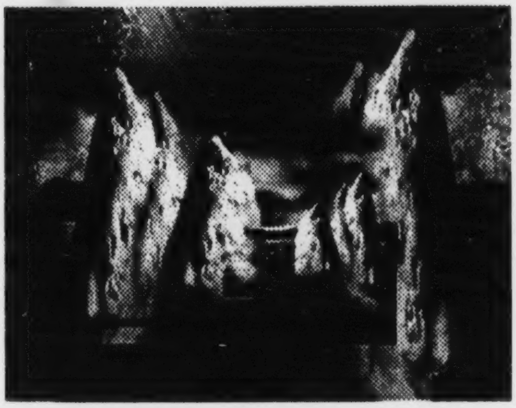
Effects

The art / machine debate began in the Industrial Age, and continues with the quandary of photography, the computer and beyond. Just as photography proved to be a new means of expression, creation, innovation, and communication; digital imaging now offers new modes of visualization and presentation.



Mary Stieglitz 'Cirque', 1995

Traditional photography will continue, but the influence of electronic technologies will be abiding. The nature of art and the creative process is again scrutinized in relation to computer technology. The electronic revolution offers alternatives that were previously not available. The camera is vital but not final.



Howard Huff 'Copper Basin #1', 1993

We are at a critical historical juncture. The widespread adoption of electronic technology is providing new avenues of exploration. The synergistic potential reflects the influence of photography on painting in the nineteenth century. Technology is rapidly evolving, and issues concerning the content and fabric of visual imaging are now being addressed.

Beyond

One evident question centers around fears that machines could replace humans. Can the computer create art? Will we reach a point in time where the computer is a creative / intelligent entity? At this time, we know that it can extract commonalities and patterns from differing sources. Pattern recognition and the ability to construct new combinations which have a similar pattern is feasible. The computer can generate forms 'in the style of' if it is provided enough examples of that style and asked to extract certain characteristics.

If computers can abstract and extract various 'qualities / elements / structures' from great works of art (visual, musical, culinary, literary, et al), and recombine those elements in new constructs, would this produce new 'great works'? Could the works possess the unique qualities of those produced by humans?

Douglas Hofstadter (1995), in a recent presentation to the International

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Symposium on Electronic Art, considered this question and asked if there might be something deeper than patterns and basic levels of style. The computer can produce 'look alikes' on some level, but what is at the center? Does it get it all the way down to the core, the profound, the moving? Does art come from the core? Are these higher levels intuitive, non-verbalizable? It is easy to imitate, but inventing style is related to the depth of the human mind. Style breakers are considered creative, but anyone can work 'in the style of', producing good imitations.[3]

When the computer mimics style the greatness may be in the input. The invention of the style done was by the artist whose patterns were programmed into the computer. Jazz great Dave Brubeck (1995) commented in a recent concert that 'breaking the rules' was critical to his art and the style of his music. He referred to changing signatures within works, and interfacing with other musical traditions.[4]

Many regard computer use as relinquishing 'hi touch', yet the human factor is critically important. The machine plus the human factor is more synergistic than machine alone. The tool alone is never the artist. Technical proficiency alone does not produce the aesthetic statement. The tool in teamwork with the artist serves the artistic process best.

Tools and techniques only serve, it is the conceptual and visual encounter that endures. The interaction of human and machine is richly expressed in the visuals presented. The gap between artist and technology is narrowing as artist's intuitively meld the real with fabrication. This obscures the distinction between the actual environment and the altered image.

Ritchen (1990) comments that the primary question to be addressed to ourselves as a society is "Will we put the new technology to use recycling what we already know or use it to attempt new understandings? It is up to us, if we can, to take advantage of the new technology's potentially illuminating perspectives; otherwise, it will be we who are taken advantage of and diminished, frozen in our own image."[5]

New technologies enable artists to look at things in new ways, push technique beyond the traditionally possible, and to go beyond mere fascination with the tools to personal, individual statements.

The basic way that visual images are created has fundamentally changed, as has the way we think about those images. Electronic imaging will necessitate new ways of perceiving, knowing and judging images.

Note:

The author wishes to acknowledge the Idaho State Board of Education for its generous support of the research

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Visualizing The Internet: Examining Images Constructed By Beginning Users

by Thomas J. Philleo

While working with graduate education students in a course aimed partially at providing them with basic skills in using the Internet, a frequently asked question was, "Am I on the Internet yet?" This was viewed as a problem in concept learning which might be addressed from an informal, action research approach.

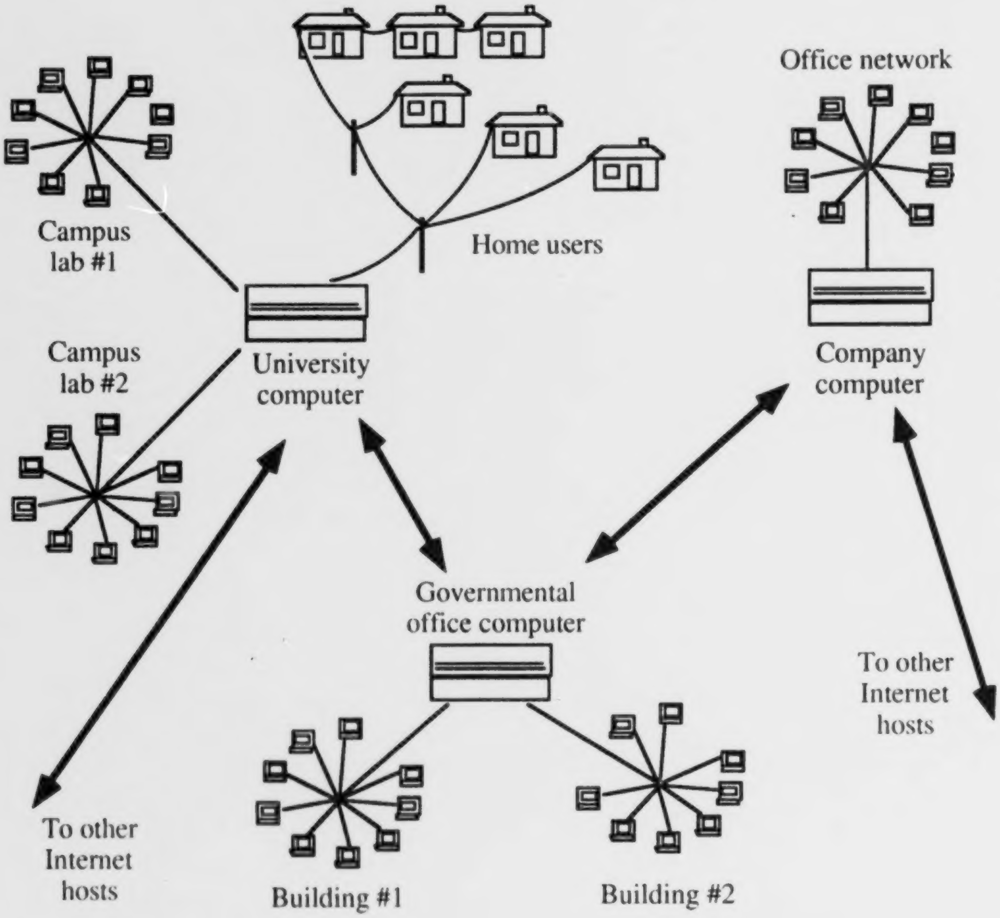
The basic problem seemed to be that students did not have an adequate understanding of the structure of the Internet and were therefore not able to comprehend what it means to be "on" the Internet. With so much coverage in the media about the information superhighway, the infobahn, and so forth, it seemed important that these students, most of whom are teachers or in pre-service training, should have a clear understanding of what constitutes the Internet and what does not.

It also seemed important that they understand what it means to be connected to the Internet and therefore be able to answer the question "Am I on the Internet yet?" In order to do so it was felt that beginners might be aided by an understanding of these four aspects of the Internet: (a) it is a network of networks, (b) a connection to any one of these networks is a connection to any other user on the Internet, (c) the Internet provides connections to networks all around the world, and (d) when connected to a network which is part of the Internet, the user is also connected to the Internet. Although there are certainly many other characteristics which might also be added to these, it was felt that simplicity was desirable.

Creating a visual

The first part of the problem appeared to be the creation of a visual which would accompany the verbal information. Simply attempting to expand the verbal explanations might lead to further problems since many of the students were first time computer users. "Verbalism—the use of words which are not understood—is a disease usually caught in school" (Dale, 1946) and it was felt this might be avoided through the use of a visual. The importance of visuals in concept learning may vary according to the material, but in this case, because of the complexity of the concept and its relative unfamiliarity to most students, it was felt that a meaningful visual in the form of a diagram would offer students an additional building block in their construction of this concept.

Figure 1
THE INTERNET: A LOCAL SECTION


Office network
Campus lab #1
Home users
Campus lab #2
University computer
Company computer
Governmental office computer
To other Internet hosts
To other Internet hosts
Building #1
Building #2

What should the visual look like? After some examination of the problem it appeared that there might not be an easy answer to this question. Several diagrams and illustrations from published materials were examined, but none seemed to provide adequate information for this purpose. An adequate representation of the Internet would require an immense amount of detail in order to provide student with one of the key facts needed to grasp its essential character—it is a world-wide network of networks. Given this definition, the Internet might be more accurately described as a construct rather than a concept. Lowe (1993) suggests that a good diagram should contain five to seven elements and that any nonessential visual information be eliminated. Considering the complexity of the Internet, this seemed problematic.

Figure 1 is an attempt to create a diagram showing how individual users are connected to host computers and how these hosts are connected. This diagram illustrates only a small, sample section of the Internet and, although it contains the basic elements, it fails to give an overall view of the way in which networks are connected world-wide. This inadequacy might possibly be overcome by the use of a second diagram which would include some representation of the first diagram as a small inset.

The diagram in figure 1 is strictly experimental and is not intended to be absolutely accurate nor is it the work of anyone but an amateur illustrator. Its purpose here is to offer the reader a look at the kinds of problems that were encountered in the process of attempting to produce a usable diagram for the classroom and to offer a comparison between the kind of visual that might be prepared for instructional use. It will also serve as an interesting contrast to the drawings discussed below.

Drawings by users

At this point however, an interesting question arose. Could students who had already begun to use the Internet provide some insight into how a good diagram might be constructed? If students who had completed the five weeks of course work in this area were asked to make a sketch of the mental picture which they had when thinking about the Internet, what might be found? This intriguing prospect lead to the distribution among these students of a sheet of paper with the following instruction:

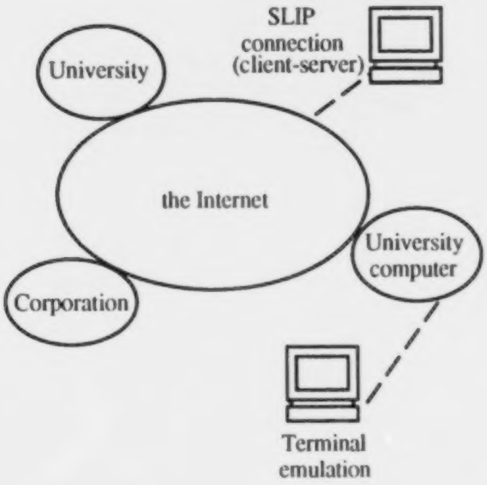
> I would appreciate it if you would help me by drawing a diagram or illustration of the Internet as you understand it. You might imagine that you are going to use this to help a friend or student who has not yet used the Internet understand some basic ideas about its various parts and functions. Do not be concerned about the quality or accuracy of the drawing. The purpose is to represent what you see in your "mind's eye."

On the back of the paper students were asked to answer several questions related to the Internet and how it works.

Thirty-four drawings were collected. As might be imagined, there was an interesting variety in the way these users rendered the Internet on paper. The range varied from two boxes connected by a line to a complex drawing showing various organizations linked to each other and labeled with acronyms and technical terms.

Examination of the drawings revealed several patterns. The most dominant was related to a learning experience that students underwent about four weeks prior to the creation of these drawings. Students had been shown a rough sketch on the whiteboard which was drawn while explaining the difference between a terminal emulation connection with the university computer which treats the users own computer as a "dumb" terminal and a client-server connection which creates a temporary address for the user's computer and allows it to make a direct link to other Internet computers. Figure 2 shows the simplicity of this drawing and its highly abstract visual reference to the concept of "network of networks" or to the world-wide nature of the Internet.

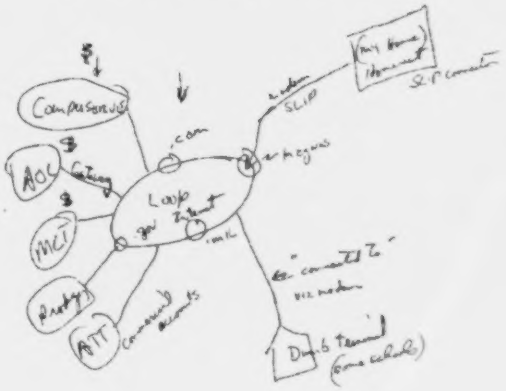
Figure 2
WHITEBOARD ILLUSTRATION


SLIP
connection
(client-server)
University
the Internet
University
computer
Corporation
Terminal
emulation

Of the thirty four drawings done by students, sixteen of them clearly reflected this drawing by including some sort of loop connecting parts of the Internet. This was a somewhat unexpected result since the impact of the whiteboard illustration was expected to be overshadowed by their subsequent personal experiences in using the network and by the construction of their own ideas about what it might look like. Although each student's drawing was a bit different—the labels, the way in which the loop was illustrated, or the types of computers connected—the quality of "loopness" was very apparent in each of the sixteen drawings.

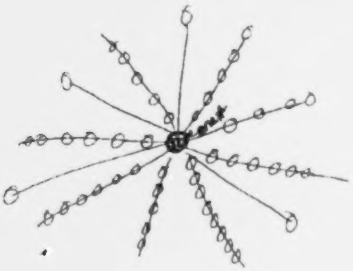
It would appear that each of these students had readily adopted the loop and added their experience to it; they had not reconstructed another image to better fit these experiences. Figure 3 shows an example of a typical student's drawing which fits this pattern. This seemed to emphasize the way in which visuals encountered in the early stages of learning can become an integral part of student understanding and raised several questions about the role of visuals in instruction.

Figure 3
THE INTERNET AS A LOOP


$
Compuserve
$
AOL
$
MCI
Prodigy
ATT
commercial accounts
.com
Loop
Internet
.gov
.mil
SLIP
modem
(my home)
SLIP connection
"connected to"
via modem
Dumb terminal
(some schools)

Another interesting pattern which was evident in five of the thirty-four drawings depicted users surrounding the Internet in a spoke and hub configuration (figure 4). Their illustrations allowed little or no room for diagramming the structure of the Internet itself but implies that it is simply a connecting point between users. However, comments on the reverse sides of the drawings such as, "the Internet is a massive computer system that permits me to access individuals," and "the Internet is a vast field of electronically retrievable information" indicate a slightly different view. Representing the Internet as a small, featureless point or block in their drawings while describing it as "massive" or "vast" raises some interesting questions about the relationship between what students draw and what they think.

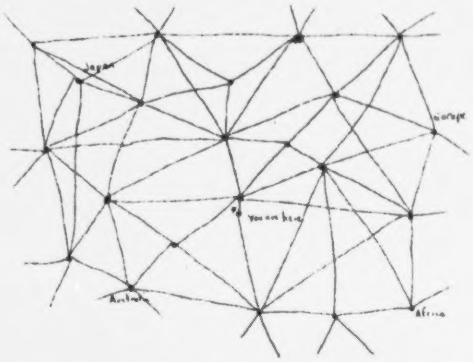
Figure 4
THE INTERNET AS THE CENTER



Only three of the students' illustrations provided any visual clue as to the world-wide nature of the Internet. This was shown in two of the three by the inclusion of a sketch of the globe and in the third by indicating the location of several continents in a web of connecting lines (figure 5).

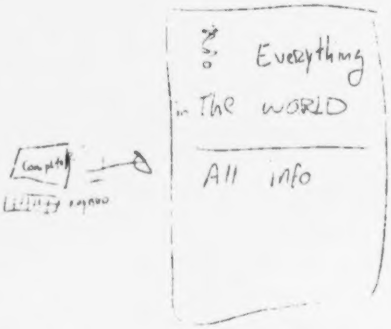
The remaining ten drawings generally showed the Internet as a box connected to the user's computer (figure 6), a series of boxes and circles connected by lines, or small drawings of computers with lines indicating their linkage. These renderings tended to reduce the Internet to its simplest elements—a computer linked to another computer or computers—but left out any visual information about networks or the world-wide character of the Internet.

Figure 5
THE INTERNET IS WORLDWIDE



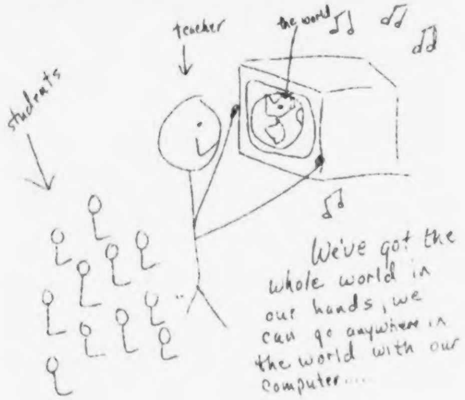
Labeled points in this drawing indicate Japan, Australia, "You are here," Europe and Africa.

Figure 6
THE INTERNET AS CONTAINER



Of the thirty-four only one person chose to represent the Internet with a picture rather than a diagram and included representations of musical notes and a short verse to a familiar song (figure 7).

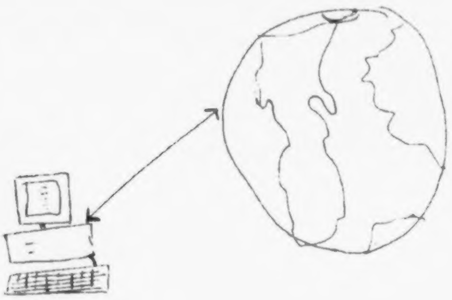
Figure 7
PICTORIAL RENDERING


teacher
the world
students
We've got the whole world in our hands, we can go anywhere in the world with our computer....

Drawings by non-users

As an extension of this work, it seemed that an interesting contrast to these drawings could be created if the same task was given to beginning students in the course who had not yet been given any instruction or exposure to the Internet. Although a small minority of these students had used e-mail, none had ever used the Internet for any other purpose and their ideas were likely based on interpretations obtained from the media or conversations with others.

Figure 8
NON-USER'S VIEW: WORLDWIDE



A look at these drawings showed that eleven out of thirty-one participants included some visual element to indicate the world-wide character of the Internet (figure 8). This is in sharp contrast to the drawings rendered by the first, more experienced group of whom only three included any visual reference to the world or the globe.

Five of the remaining twenty drawings followed a pattern previously referred to as hub and spoke, three used small boxes or circles connected by lines, and the rest were either blank or contained a drawing that did not communicate any particular meaning relative to the Internet, understandable since these were students who, as previously stated, had no real experience in using it. It should also be noted that none of these students chose to represent the Internet as a loop or as having any of the characteristics of a loop.

Conclusion

Is it really important for beginning users to have an understanding of what the Internet is in order to use it effectively? Is it necessary that they have some sort of picture of how the Internet looks in order to utilize it? Although learning to send e-mail, using Gopher, or transferring files from one computer to another is accomplished through a rule-learning process, it may be that in order to solve problems that arise with Internet use or to be fully empowered to explore its resources, some sort of realistic-looking mental image might prove helpful.

The recent popularity of the World Wide Web provides an example. If beginning users are to make clear judgements about how to use the "Web," they may need to understand that the Web does not exist as a separate entity apart from the Internet, despite the implication of its name.

If users understand the basic "network of networks" concept and can visualize the way connections are formed world-wide they may be better able to work through confusing terminology and misleading metaphors in order to accomplish what they want when using the Internet as a resource for teaching and learning.

The drawings made by the experienced group of students seems to indicate that when a visual was used in this context, nearly half retained its image and adapted it to their own varied experiences. If that is the case, then perhaps the visuals that we use are more important than we may sometimes think. If some students structure their experiences around a visual which is oversimplified or inadequate, it might impair their ability to build more meaningful knowledge structures by rejecting new knowledge which cannot be adapted to the existing visual model.

On the other hand, many of those whose drawings did not appear to represent the Internet in any reasonable way, still retained accurate verbal knowledge of its character. For these students, retaining a representative visual may not have been necessary for building a usable concept about the structure of the Internet. Naturally, it may also have been the case that they simply were not willing or able to reproduce their mental images of this concept on paper. Examining the relationship between what learners know and what they draw raises the kinds of questions which are well beyond the scope of an action research project but which could be a reminder that students learn and think in different ways, that their use of and preference for visual material varies, and that there are many unanswered questions relating to the ways in which learners visualize the concepts which they build.

Although the original intent of creating more effective instruction about the Internet by creating a meaningful visual has been overshadowed by the questions raised by looking at students' drawings, efforts to produce and implement a useful visual are currently underway. It is hoped that more work in this area might be helpful to educators who are involved in teaching learners of all ages about the Internet and its potential.

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Lowe, R. (1993). Successful instructional diagrams. London: Kogan Page.

A Semiotic Analysis of Icons on the World Wide Web

by Yan Ma

Introduction

The World Wide Web (WWW) allows users to interact with graphic interface to search information in a hypermedia/multimedia environment. Graphics including color lines serve as indexes or reference points on the World Wide Web for searching and retrieving information including texts, visuals, and sound materials in a non-linear fashion. This study examines the codes embedded in the icons on library homepages of Webs. Icons in this study refer to iconic indexual signs. Codes are syntax patterns that are culturally constructed. They have paradigmatic meanings. A semiotic analysis of the icons used for information retrieval purposes on the library homepages is presented here. A further study on how the icons influence users' information seeking behavior is being conducted.

Theoretical Construct

Semiotics is the theory of signs. As Eco explains that semiotics "studies all cultural processes as *processes of communication*" (Eco, 1979, p. 8). Ann DeVaney's semiotic model for the analysis of social and cultural issues in educational television is used for the study. Her model was based on the theories of Ferdinand de Saussure, Roland Barthes, and Christian Metz who emphasize that knowledge is socially constructed through language or communication systems. In other words, meaning is socially and culturally built. The concept of **sign** contains two aspects: **signifier**, which is the sound-image and **signified**, which is the concept. For example, the relationship between the concept of a "book" (the signified) and the sound-image made by the word "book" (the signifier) forms a sign. "Signs are further organized into systems of meanings or codes" (Muffoletto, 1994, p. 302). Semiotics, like structuralism, studies the relationship between form and meaning. "Signs are assigned meaning based on historic patterns of use that are recognized within social/cultural groups. These patterns of use are called codes" (Pomper, 1988, p. 18). A sign comprises of two types of meanings: syntagmatic and paradigmatic meanings. Syntagmatic meaning refers to the meaning that is assigned based on syntax, or based on the relationships among signs. Paradigmatic meaning is derived from other systems or codes. The icons on the homepages of the WWW carry meaning dependent on the syntax of their use. They also carry paradigmatic meanings derived from other systems or domains.

Selection of Icons

C. S. Peirce (1958) categorized signs into three types: the index, the icon, and the symbol. An *index* bears a clear direct relationship between object and what it means, such as the relationship between smoke and fire. An *icon* has a physical resemblance relationship between an object and its meaning, such as a photograph of a person. A *symbol*, quite unlike the index and icon, has no inherent relationship between the object and its meaning, but derives all meaning from cultural convention (Sewell, 1994, p. 137). In this study, the term "icon" refers to iconic signs and indexual signs. Icons selected from library homepages belong to these two categories.

Stratified sampling, a social science research design is used to ensure that appropriate numbers of elements are drawn from homogeneous subsets of that population (Babbie, 1990, p. 86). Stratified sampling achieves a greater degree of representativeness of a sample. It allows me to select icons based on their representative characteristics. Instead of including all the homepages on the WWW, this study draws samples from more 200 library homepages on the WWWs, some of which contain iconic signs and indexual signs to index resources.

According to Cleveland, "an index can be defined as an orderly guide to the intellectual content and physical location of knowledge records. ... An index is a pointer or guide and as such does not generally supply the desired information itself" (Cleveland, 1990, p. 26). Literature on how to index books and visual images has focused on the efforts made to index these materials or objects. Nothing has been documented on how the icons on the WWW have been used as index pointers to play a role in retrieving information on the Web. These index pointers are created by people in various fields who may or may not have professional training in indexing.

Research Method

The research method for this study is based on Ann DeVaney's model for semiotic analysis of educational television (DeVaney, 1991, p. 268). It consists of five phases: format identification, segment identification, elements of construction identification, quantitative analysis, and qualitative analysis. In the domain of television, formats may include educational television, comedy, dramatic narrative, etc. Segments may be the beginning, end, or climax for a television program. Elements of construction may include the syntax in the visual track, such as frame, shot, and sequence. The fourth and fifth phases are to analyze the form and meaning of the media.

For this study, the format is library WWW homepages. Libraries and information centers in the United States and other countries in the world have been introducing computerized information retrieval systems to their users for more than two decades. Information retrieval systems and services available in most of the academic and public libraries in the United States include online database searching, CD-ROM searching, online public catalogs, other related systems, and more recently Internet access to electronic resources. With the building of the information superhighway, users are no longer limited to the resources in a particular library or in a specific form. Information on the Internet represent several formats. For example, users can retrieve information through Gopher, a menu-driven system, or, WAIS, a text-based system. What differs from traditional information retrieval systems or other systems on the Internet is that the WWW is a graphic interface based system. The WWW offers a multimedia experience for Internet users through graphic browsers such as Mosaic, Cello, and Netscape. Many iconic and indexual signs appear on homepages to guide users to different information sources.

The second phase is the identification of segments. Segments here are defined as specific icons used to index library resources, for example, the icon for the library, the icon for online catalog, the icon for references, and the icon for collection. Since library catalogs, reference services, and collections are the three major functions of library operations, they have been chosen as the resources on the library homepages for the study. This study analyzes the sample icons used to index library catalog, collection, and reference services on the library homepages.

The third phase is to identify the codes and syntax embedded in the icons. This study uses semiotics and structuralists theories and their methodological approaches to studying cultural messages. According to stucturalist view, meaning is created based on the form or structure of the materials. However, codes and syntax are culturally constructed, which shape the meanings of messages conveyed in the icons. A user may construct meaning in a social manner. Codes are created by conventions of production that are repeated daily. Based on John Fiske's writing, Kervin (1984) explains that "everyone learns how to perceive the world through codes; these same codes are then replicated within the cultural products (p. 82). DeVaney (1991) also states that "codes are rules of relationships and derive from specific syntax. They do, however, have paradigmatic meaning embedded in them" (p. 259). Just like language has its syntax structure, a television program segment has its syntax, a computer language also has its syntax, so do the icons on the Web homepages. The syntax in the WWW are basically in four formats at present. First, the hypertexted words are mostly highlighted in blue color and/or underlines although there are exceptions. One can click on the colored part(s) to get further information. Second, some icons are framed in blue borders, which are clickable. The hypertexted icons lead users to further information. Third, some clickable icons are within a bigger graphic image. There are multiple clickable icons within the bigger image. Fourth, one of the new features in Netscape, a WWW browser, is to allow the hypertexted region to blink so that it catches users' attention to click on this area to read more information.

The fourth phase is to carry out a quantitative analysis of the structure of icons used for index purposes on the library homepages. It answers such questions as "How many times is a particular icon used to index the same type of resource on the library homepages?" "How many different types of icons are used to index the same type of resource?"

The fifth phase is to conduct a qualitative analysis of the meanings of icons used to index resources on the library homepages. It analyzes the interaction of structure and resources in terms of its connotations of the icons. If the same icons are used to index the same type of resources on different homepages, how do these icons interact with the resources they indexed. If the same icons used to index different type of resources, how do these icons interact with the resources they indexed. Semiotics provides a theoretical base for the analysis.

Focus Questions

In order to study the structure and meaning of icons on the library homepages, the following focus questions are developed:

1. What are the codes embedded in the icons on the library homepages?
2. What are the original meanings of the codes?
3. How do the meanings of the codes in their original domains or formats compare and contrast to the codes embedded in the icons in this study?
4. Why were these codes used in the icons on the library homepages?
5. How are the icons used to index the resources on the homepages?
6. How many times a particular icon is used to index the same type of resources?
7. How many different icons are used to index the same type of resources?
8. Do the icons help retrieve information?
9. Do the codes embedded in the icons have influence on retrieval the information?

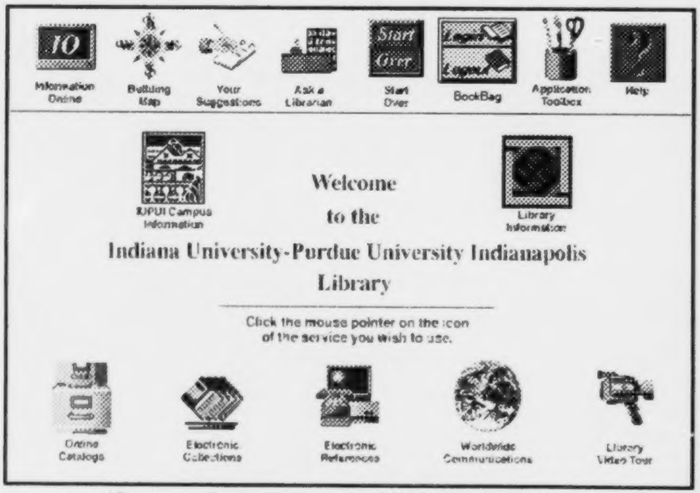
Quantitative Analysis

The author examined 150 United States library homepages. Among which 50 homepages contain icons that are used to index various resources. Since the author focused on three types of resources of library services, i.e., catalog, reference services, and collection, more attention was paid to examining icons used for these type types of resources.

1. Catalog. Similar icons such a book or books are used to indicate "catalog" or "online catalog." But book icons are also used to index "collection" or "reference shelf."

2. Reference Services. The traditional reference services is identified as such that users can approach the reference librarians to seek information or help. In this environment, users need mediators to direct them to the information resources. In the networked environment, the users are in a self-service condition. Not many icons are found for traditional references services. One of the multiple icons in the Indiana University--Purdue University Indianapolis Library's homepage is "Ask A Librarian" which contains an image of a stereotype reference desk where sits a person with a bookshelf behind her/him. The other icon is an image of a computer with a telephone on top of a modem to identify "Electronic References." This shows the

Figure 1
IUPUI Library Homepage


IO
Information Online
Building Map
Your Suggestions
Ask a Librarian
Start Over
Start Over
BookBag
Application Toolbox
Help
IUPUI Campus Information
Library Information
Online Catalogs
Electronic Collections
Electronic References
Worldwide Communications
Library Video Tour

Welcome
to the
Indiana University-Purdue University Indianapolis
Library

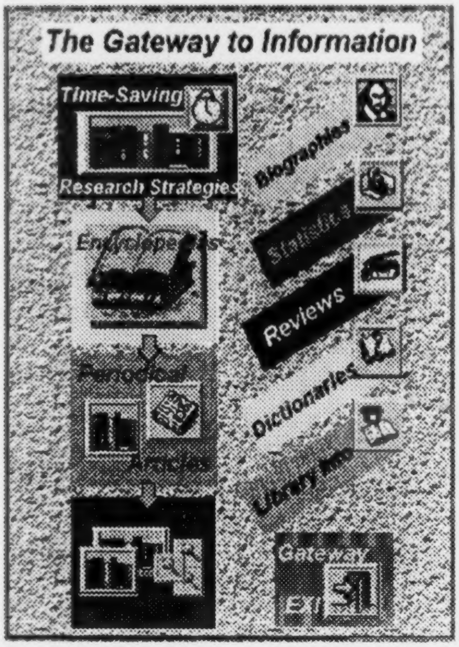
Click the mouse pointer on the icon
of the service you wish to use.

(Source: http://www.medlib.iupui.edu)

change from the traditional references to the self-services available through the Internet.

3. Collection. The concept of collection is definitely not limited to the books, periodicals, videos, and manuscripts, but the vast amount of information in multimedia format on the Internet resources. Icons are used to index such resources as "Gateway to Information," "Gopher Services," "World Communications," "Electronic Collections," etc. The concept of traditional collection includes print and non-print materials held in a library. Information on the Internet may include periodical articles, biographies, reviews, dictionaries, encyclopedias, statistics, etc.

Figure 2
Ohio State University Library Homepage Section



(Source: http://www.lib.ohio-state.edu)

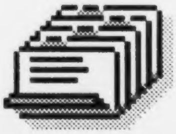
Qualitative Analysis

Meanings are constructed based on both structure of the icons and the resources in the WWW, and on their interaction. By gathering both structural and contextual information from the sample icons to create an outline of their denotative level, a full examination of their cultural meanings could then be undertaken. This part of the study is to answer the following focus questions:

1. What are the codes embedded in the icons on the library homepages?
2. Where are the original meanings of the codes?
3. How do the meanings of the codes in their original domains or formats compare and contrast to the codes embedded in the icons in this study?
4. Why were these codes used in the icons on the library homepages?
5. How are the icons used to index the resources on the homepages?

The author selected sample icons for the qualitative analysis. First, the author traced the origin of the meanings of these icons used to index catalogs, references, and collections. Icons of a Rolodex box and books are selected.

Figure 3
"The Card Catalog"

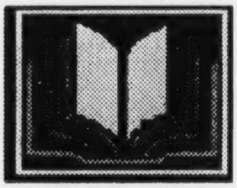


(Source: http://www.kerr.orst.edu:80/info/bull/libgde/lghome.html)
"BPL's Index to the Internet"
(Source: http://www.ci.berkeley.ca.us/bpl)

BEST COPY AVAILABLE

The original meaning of a Rolodex is a file box for filing business or addresses cards. It is a way to organize the information for easy access. The Rolodex icon on the library WWW homepages is to index both card catalog and the Internet resources.

Figure 4
"Library Online Catalog"



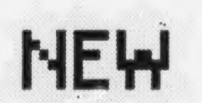
(Source: http://www.nalusda.gov)

The original meanings of books are related reading, learning, and studying. Book icons are used to index library catalogs including online catalogs, collections, encyclopedia, and periodicals.

Various computer icons are used on library Web homepages to index online catalogs, databases, Internet resources, and electronic references.

Because of the limited space for this paper, only a few of the icons can be presented here. The following is an analysis of some sample icons used in the library homepages which carry codes with strong cultural meanings.

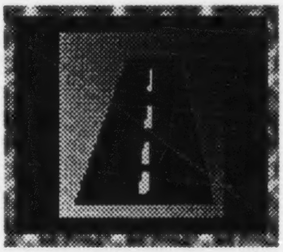
Figure 5
"Encyclopedia Britannica Online"



(Source: http://www.lib.lehigh.edu)

The icon "new" appears on many library homepages to index newly added resources and newly added hypertexed links. Originally, the icon "new" was used on commercial products to tell the consumer that this is a new product or new improvements have been made to the products. The intention is to attract the consumers' attention. Borrowing this icon to index the newly added resources and links on the library homepages is to attract the users to use the new resources.

Figure 6
"Search and Explore the Information Highway"

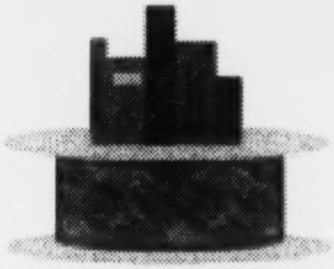


(Source: http://www.library.drexel.edu)

This "highway" icon appears on many computer game screens. It represents a common highway in the United States. The "highway" icon is used on library homepages to index resources on the Internet, which is an information superhighway.

These sample icons provide direct and/or indirect assistance with users' information retrieval. Many misleading, confusing, meaningless icons are also used to index resources on the library homepages. For example,

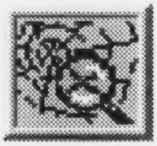
Figure 7
"The Ethics Collection"



(Source: http://www.library.drexel.edu)

This particular icon is used to index a ethics collection. The author has asked four different individuals to interpret this icon, none of them could understand why this icon is used for this purpose.

Figure 8
"Let's Search the Internet"



Source: http://ws1.databank.com/~lawrlibr)

This icon is used to index the Internet resources. Without a high resolution monitor, it is hard to tell what this icon is. Vaguely, the icon shows a Web and a magnifying glass. How much help a use can get from this icon to search information? It is hard to determine.
May be it is as vague and confusing as the icons looks like.

Conclusions

The conclusions of this pilot study resulted from the semiotic analysis of sample icons on the library Web homepages. As expressed in the focus questions and qualitative analysis that this study investigates the structure, codes, the original meanings of the codes, and how the codes are represented in the icons. The results show the encoding process of icons, which carry cultural codes to index resources on the Webs. These codes are mainly rooted in Western culture and newly merging culture such as the Internet culture.

Since the Internet has been challenging and changing the way of how information is disseminated and used, new and different services, resources, and methods of organizing information have been intertwined with traditional library operations. The results of the study indicate that old icons are borrowed to index new resources and services on the Internet. Many icons are used to index new resources and services such as "Electronic Reference," "Electronic Collection," "Internet Resources," "Virtual Reference Desk," and so on. Applying semiotics to study the icons on the library Web homepages has challenged the traditional practice of indexing. It contributes to the research of indexing by analyzing the cultural codes embedded in the indexual signs used for index purposes.

Based on this pilot study, further studies on how the icons influence users' information retrieval can be carried out. The author will study the relationship between and the designer, text/icon, and user to investigate the meaning creation process and examine the user information seeking behavior.

[I wish to thank Professor Ann DeVaney for her advice on the paper and Mary Rowe for her continuous supply of URLs of library Web homepages and her interest in the project. Mary also served as my

interviewee to verify the codes in the icons.]

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Anthropomorphizing The User Interface: A Case For Interface Guides

Marshall G. Jones

Anthropomorphism and Interaction

Anthropomorphism, as defined by The American Heritage Dictionary, third edition, is the "attribution of human motivation, characteristics, or behavior to inanimate objects, animals, or natural phenomena." Anthropomorphizing inanimate objects is something that we do on a daily basis. People name their cars, boats, and computers. A colleague of mine told me that he was having problems transferring a file to me via the internet. His comment was, "Calvin (the name of his computer) must be feeling a little off today." Our computers are out to get us; our cars are feeling good. Everyday we attribute human characteristics to non-living objects. It is a technique we use to help our human selves relate to complicated pieces of technology that we use regularly, but do not fully understand.

Computer software has long attempted to make its complex algorithms accessible to the user. Software designers and developers continue to strive to make their interfaces *intuitive*. I argue that software, by its very nature, cannot be intuitive. It is a contrived environment. It is not like anything else. For people to be able to intuit what to do next, they must have a frame of reference to begin from. While it is certainly true that because I can use one word processor, I can use any word processor, it is not because the new word processor is inherently intuitive. It is because somewhere in my past, I learned to use a word processor. The functions of a word processor were taught to me, either by someone else, or by a manual or other piece of instruction. I can intuit what needs to be done only because I have a frame of reference based in my experience with using application software, in this case, a word processor. Educational software is even more problematic.

In educational software, people have the luxury of repeated use. While my word processor may offer thousands of functions, I may only use one hundred of them on a regular basis. When faced with a complex task, I can work through the problem because I have experience in using the word processor. Once again, through the frame of reference of my experience, I can learn new functions, and perform more complex tasks because of my repeated, daily use, of my word processor. In educational software, people do not have the luxury of repeated use. In many cases, we expect our software to be used once, maybe two or three times. Users are in the software to gain the knowledge and or skills they need, and then they leave the software (Jones, 1995). Consequently, they typically do not develop the skills they need to perform complex tasks in the software. The software needs to be obvious, sometimes painfully so. When designers and developers watch people use their software, they are often amazed that people do not know what to do, or that they miss important features of the software. What is obvious to us, because of our experience in using, designing, and developing educational software, is not always obvious to novice users. Schneiderman (1987) says that software needs to have progressive help. Features should be built in to the software that make it easy for a novice to understand, but that shortcuts should be built in to allow for the development of *power users*. This is quite evident in application software. In nearly every word processor available today, the user can give the commands to copy and paste by selecting the options from the **Edit** menu. However, most people, as they become more experienced in word processing, will bypass the menu in favor of the keyboard equivalent (e.g. command/control C for copy, command/control V for paste.) Be it educational software or application software, users need tools available to them to help them begin the often times complex task of learning to use their programs.

Microsoft products help soften the blow of entering sophisticated pieces of application software by providing us with *Did You Know* statements when we open the software. Computer games provide us with dramatic representations of *real life* to help us understand and interact with them. The purpose is to take a complicated activity and make it seem some how non threatening. Or, to use the well worn cliché, user friendly.

Anthropomorphism in the computer interface is not only about making our programs look life like, but it is also about making us think that our programs *know* us. One example of this is the oft used technique of using a person's name in a piece of instructional software (Alessi & Trollip, 1991; Keller & Suzuki, 1988). When the user starts the program, their name is entered. As they make progress, their name is used in dialogue boxes telling them of their triumphs and failures, thus attempting to give the user the impression that the computer knows them, and is somehow on their side.

Early computer-based instruction (CBI) was fairly linear. It was hierarchical in nature, and users found themselves working through menu items to complete different sections. Navigation was simple. You progressed from one screen to another by pressing the space bar, or clicking on the right arrow, to continue. Jumps between ideas, when they were made, were typically made back to the main or previous menu, where another section was selected.

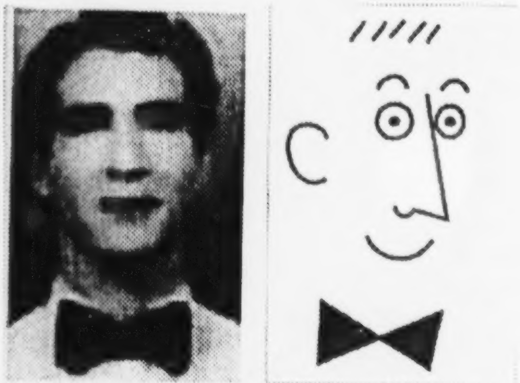
In today's complex multi-media software, users are faced with a daunting task. Large learning environments are difficult to manage. Sophisticated environments which combine multi-media and hypertext capabilities provide users with a wealth of options (Jones, Farquhar, & Surry, 1995). Jonassen, (1988) was one of the first to recognize that allowing users to work in an associative manner, i.e. allowing users to follow their own path rather than the path set forth by the designer, could help deepen the level of processing of the information by the learner. This is good. But to make those links, the software must provide for those links, which means that the designer must discern them, build them in, and make access available to them by the learner. This is hard. And it is not hard just for the designer. It is hard for the user as well. Well ordered hierarchical systems are organized fairly succinctly by the use of menus. Interactive learning environments are often difficult to represent with a traditional menu. Different methods of navigation are in place; comparable methods of organization are not.

Interface Agents and Interface Guides

Interface guides may be subsumed by a concept known as Interface Agents (Laurel, 1990; Laurel, Oren, & Don, 1992). Interface agents are navigational devices in the user interface which take action on behalf of the user. They do something for the user. These have been demonstrated in commercials by AT&T, where an intelligent agent, represented as a happy, tail wagging dog, tells a groggy, coffee drinking woman what is in store for her during the day, including his attempts at trying to get her playoff tickets.

Apple Computer also theorized about the possibilities of an interface agent in their futuristic promotional videotapes (Laurel, 1990). "Phil" is an electronic butler of sorts who manages the affairs of a college professor (See Figure 1).

Figure 1
Two representations of "Phil." The bow tie becomes an iconographic symbol, making the graphic recognizable in either representation. (From Laurel, 1990, page 365)



Phil brings up maps for the professor, contacts colleagues who will do guest lectures, and reminds him of his mother's birthday. The purpose of the agent is to manage the complex internal capabilities of the computer, freeing up the user to do what the user would rather do. Voice recognition software allows the user to work with the computer without being in front of the computer. But it does more than that: it makes the computer human in ways that we can, at the moment, only imagine, but can still understand. This concept of the interface agent, like most literature on user interface design, focuses on system software and application software. The question becomes how can this idea be extrapolated to become relevant to educational software?

Interface Guides in Educational Software

Oren, Saloman, Kreitman, and Don (1990) attempt to answer this question by introducing the idea of an interface guide. Interface guides are navigational and organizational emissaries that exist within the educational software. They represent the best interests of the user. A guide may become an internal coach for the user, suggesting direction, providing feedback, and even encouragement, as the user works within a large learning environment.

Examples of interface guides in software

Interface guides are probably best described within the context of one of the earliest CD-ROM encyclopedias Oren, Saloman, Kreitman, & Don (1990). A program was being prototyped that would serve as an educational database covering the American history from 1800—1850. To help users navigate the large amounts of information contained in the program, a metaphor of an interface guide was used. These guides represented people who would have lived during 1800—1850. Depending on their interest, the user could select one of the interface guides, (See Figures 2 &3). Clicking on the miner guide would return information in the database relative and relevant to the life of a miner. The same would be true for any of the other guides.

Figure 2
The list of guides from Oren, Saloman, Kreitman, & Don (1990)

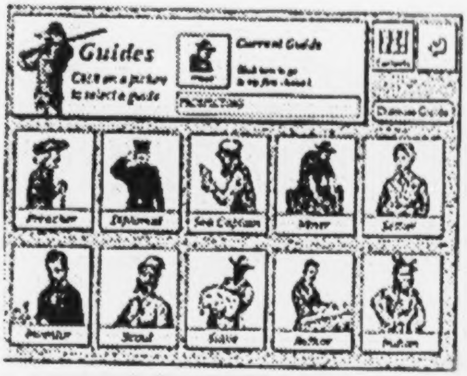
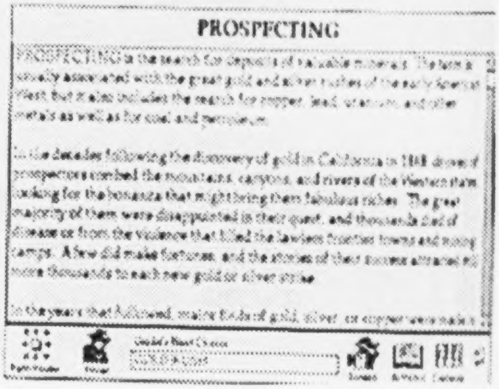
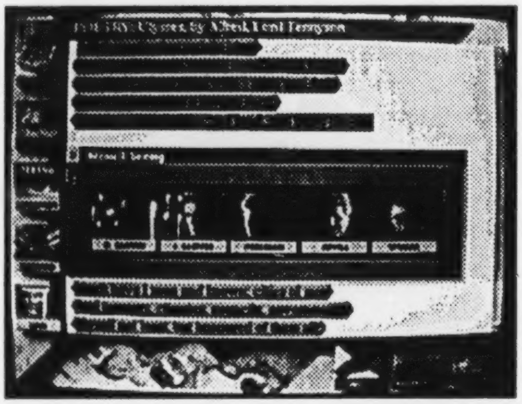


Figure 3
Information returned by guide, Miner


PROSPECTING

IBM's groundbreaking multi-media extravaganza, *The Illuminated Books and Manuscripts* provide another example of how interface guides may be used. In the exploration of Tennyson's *Ulysses*, users have the option of having the poem, or sections of the poem, read to them in different voices represented by different actors. From Danny Glover to Rod Steiger, users have a wide range of people to help them understand the poem through the use of dramatic readings (See Figure 4). These guides, though not explicitly referred to as guides in the software, provide the user with pedagogical help rather than navigational help. It also adds a bit of the human touch to the program by bringing the work of a dead poet to life by having it read by contemporary figures.

Figure 4
Guides used to explicate content from IBM's *Illuminated Books and Manuscripts.*



The Theoretical Foundations of Interface Guides

Keller and Suzuki (1988) begin, however tacitly, to introduce the notion of interface guides through the use of motivational strategies. They suggest that one way to provide motivation is through the use of human interest language and graphics. In describing the wizard in a 1985 program *Carrying*, the authors speak of the use of the person in the program serving as a surrogate teacher for the users of the program. Even in the seemingly ancient graphic display capabilities of the 1985 program, Keller and Suzuki point out that facial expressions of the wizard change on right and wrong answers to provide feedback. But Keller and Suzuki are victims of time. While they discuss the wizard, the graphics they are using seem obviously dated. They are; don't be fooled. Conceptually they are describing something that was not yet technically possible. Today we have the luxury of morphing software, digitized movies,

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high resolution display devices, and monitors capable of displaying millions of colors—the very tools we need to display more sophisticated guides. But many of the theories suggesting the use of guides exist in Keller's ARCS model, and Jonassen's (1988) early discussions of generative learning environments. The technology available to us today provides us with the storage space needed to include digitized video and audio in our program. Many desktop machines today have more Random Access Memory (RAM) than the machines of 10 years ago had storage space. This provides us with enormous opportunities. However, we would be ill advised indeed to go about this simply because we can. Rather, guides should be used to provide navigational, structural, and pedagogical aid to the user.

Menus in early pieces of instructional software provided the navigation and structure that programs needed. Motivational elements were often added as an after thought. Users studied; answered questions, and were then treated to animations or sounds on right answers. Interface guides provide us with the means to provide organization, navigational help, and motivation within the software itself. Keller and Suzuki suggest that it is preferable to integrate motivational elements into the software seamlessly. But the reality was that, at the time of the writing, that was difficult to do. Jones, Farquhar, and Surry (1995) tell us that the interface of the program is a cohesive whole representing the content in the program, the visual representation of the program, and the control of the program. Interface guides provide us with a possible means for achieving the end of motivational strategies integrated into the navigational and pedagogical structure of the program.

Issues in the use of interface guides

Interface guides may provide a means of making the software easier to use. Oren, Saloman, Kreitman, and Don (1990) state that the reaction to the use of interface guides in their program was quite favorable. There are few programs on the market which employ interface guides. Consequently, most of us know very little about using an interface guide. The following is a series of issues to consider when designing and implementing interface guides.

1. Personalize and customize the interface.

While we have been told many times that personalizing the software is a good thing to do (e.g., Alessi & Trollip, 1991; Keller & Suzuki, 1988), interface guides offer not only personalization, but customization as well. A particular guide may provide the learner with exactly the direction they need. In the example by Oren, Saloman, Kreitman, and Don (1990), the ten guides offered provide a remarkable amount of flexibility. Not total flexibility, surely, but more than simply following the menu structure. Flexibility here refers to the program's ability to allow users different representation of the same content relative to the guide they select.

2. Add structure to the software by organizing content around a specific guide.

As stated earlier, menus do this as well. An individual guide can help users structure the program around their area of interest. The guides can also help users manage the information in the program by serving as signposts in the program (Jones & Okey, 1995) Once a guide is selected, a representation of the guide may be placed on the screen as a visual reminder of what the user is looking at and the perspective on the content that the particular guide brings to the program (See Figure 3).

3. **Integrate motivation and navigation.**

In many programs, navigation is a value added feature. After the content has been designed and developed, people then consider how their users should have access to the information. Using interface guides would demand that design and development issues be considered simultaneously. All information related or provided by the guides will have to be created. The system messages you will provide to users will need to be scripted. If you are digitizing your guides, the video will need to be shot. You will need to attend to these details as rigorously as you attend to your content.

4. **Zorch.**

Because of the tremendous power available to us in our computers today, we have the ability to create more creative, interesting, and realistic interactions. Saloway, (1995) tells us that our computers have more "zorch" than they did ten years ago. Zorch refers to the amount of processing power a computer has. In the early days of the microcomputers, all of the computer's zorch went to the application itself. There was not enough power to make the interface easier to use. Today, we have the processors to make the programs not only powerful, but easier to use. Using part of your computer's zorch for an interface guide, or a series of interface guides, may make the program easier for users to understand.

5. **Uncharted territory.**

While Oren, Saloman, Kreitman, and Don (1990) tell us that reaction to the use of interface guides is favorable, we don't know much about their effectiveness, nor the best way to implement them. More exploration is needed in using interface guides. More research is needed in regards to their effectiveness.

6. **System hogs.**

If you decide to use digitized video and audio to make your guides come alive, then you will have a problem of space and system resources. A single 10 second video clip with audio can require 500k to 1 megabyte of storage space. In a large program where multiple guides are used, you could be talking about needing 40 to 80 megabytes of space simply for your guides. This is a lot of space, no doubt. However, CD-POMs provide us with storage options, and the simple fact of the matter is that the gigabyte hard drive is no longer a fantasy but a reality. While much space is needed, the fact is that we may already have it.

7. **What do guides look like?**

You do not need to rely on video and audio for your guides. Static graphics and text messages take up less space, and may be as useful as video based guides. However, most of us, particularly those of us who develop on shoestring budgets, rely on clip art. And there are problems with clip art. Binns and Branch (1995) report that much of the clip art that we have available to us is rife with gender and racial stereotypes. Care must be taken in choosing your guides. Whether they are video with audio, or static graphics with text, you must decide on what your guides will look like, what they will say, and how they will say it. Guides are intended to be advocates of the user who exist within the software. An advocate should be somebody you can trust and relate to. To have all of your guides look the same, i.e. being all Caucasian, all male, all female, or all African American, may not be best for your users. Users should have the freedom to pick the person they want to represent their best interests in the software. Front end analysis needs to be done in the development of any learning environment. We are quite familiar with using front end analysis to analyze our audiences. A careful analysis of the audience will help to determine what a guide should look like. An analysis of the instructional environment will tell us what system resources are available to us, thus helping us to determine whether the guides should be digitized video and audio or static with text.

Conclusion

Interface guides may be a viable option in the development of the interaction style of a computer based learning environment. They can provide personalized and customized programs for multiple users of learning environments. By providing even greater human characteristics to a piece of software, they can anthropomorphize the user interface, thus making the software more relevant to the users. Large computer based learning environments, though engaging, can be harrowing places for a user to be. Guides can help lead them through the environment successfully.

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Graphic Learning Strategies for At-Risk College Students

by Peggy A. P. Pruisner

Literacy Preparation

There is a significant mismatch of student preparation for college-level reading tasks and the literacy demands placed upon our liberal arts college students today. Many were elementary students who received isolated, skill-based instruction; ironically, we often continue to provide instruction for these students today at the skill level, once again focusing only on bottom-up processing. Furthermore, we continue to rely on written language to facilitate verbal learning when an alternative organizer might better frame student thinking and processing of text, in reading and writing, as well as in other literacy tasks. As new paradigms move beyond the mastery of a discrete number of subskills, the focus shifts to more integrated theories.

In the field of reading, widespread acceptance of schema theory (Rumelhart, 1980) and the recognition of reading as the interaction of reader and text has resulted in two important instructional considerations: metacognition and sensitivity to the structure of text and the interrelationships between and among ideas (Applegate, Quinn, & Applegate, 1994). To teach and guide metacognition, consciously thinking about how one thinks, instruction must be based on the thinking processes. Those processes must be made transparent to the learner through awareness of thinking, monitoring when thinking has broken down, and activating strategy use, in other words, knowing when and why to use literacy strategies. Furthermore, instruction needs to focus on the structure of knowledge and the concepts that underlie content, so the relationships among ideas can be clearly identified by learners. Concise portrayal of those relationships and linkages in thinking and in text can be made using graphic organizers or representations (Clarke, 1991).

Curriculum for the At-Risk

To prepare college students identified as academically at-risk due to deficiencies in study and reading skills, we undertook the task of creating a course that would provide authentic experiences in literacy. A foundational studies course that places heavy reading, writing, and information seeking demands on students was selected and an accompanying course, LS 101:Learning Strategies, was developed. The metacurriculum formed by combining the two courses provided authentic literacy tasks whereby the strategies could be explicitly taught, practiced, and guided until they were under the control of the independent learners (Ackerman & Perkins, 1989).

To represent the thinking processes that undergird reading, writing, and information seeking, graphic representations were designed. Since reading was designated as the main criteria for identifying academically at-risk students, schema theory and the interactive model of reading were kept central to curricular decision making. Consequently, the graphic representations needed to reflect both the top-down and bottom-up processes that typify interactive reading and mimic the hierarchic structures of the mind. Since graphics can represent both deductive and inductive processing, the organizers had to be selected according to the thinking process required for the given literacy task. Furthermore, to present explicit instruction that would lend itself to the fading of teaching strategies and the building of learning strategies controlled by the at-risk learner, standard or commonly recognized graphic representations were designed and used in the initial instruction.

Thinking and Graphics

Graphics can represent the many forms of thinking. Teachers need to select a graphic that fits the content or the objective and the thinking process involved, and the match needs to be explained to the students at the instructional stage. Graphics can represent both top-down and bottom-up thinking.

Clarke (1991) suggests that top-down graphics aid deductive thinking and anchor abstract concepts, processes, rules, or procedures. Top-down visuals can test ideas against facts or solve specific problems by using concept maps to relate ideas to facts or ideas to other ideas, by using weighing scales, continuum lines, or pro/con charts to weigh evidence in support of opposing arguments, using force field diagrams to observe antithetical forces, using causal chain maps to see a model of a process, and using decision trees and if/then flow charts to assist in deciding between two choices. Finally, planning charts, path models, and procedural flow charts can be used to work through specific steps in a task. In contrast, bottom-up graphics that help students scan, sort, and organize information can include the following: time lines for representing chronological events to show trends, recurring patterns, or causes and effects; web diagrams to tie related events to a concept or idea; circle diagrams to guide students to illustrative group events; data grids, pie charts, and graphs to help count recurring events and draw inferences; Venn diagrams and complex matrices to help sort information into multiple categories; and inductive towers to help connect factual information and draw inductive inferences as the basis for theories and predictions.

Similarly, Rakes, Rakes and Smith (1995) recommend the thinking processes involved in analysis, organization, and categorization be presented using the following graphic techniques: semantic maps, flow charts, labeling, tracing, text clues, adjunct questions, and drawings; the thinking involved in elaboration: drawings, charts, graphs, maps, and icons; and the thinking involved in integration: drawings, text questions accompanied by visuals, and pseudographics.

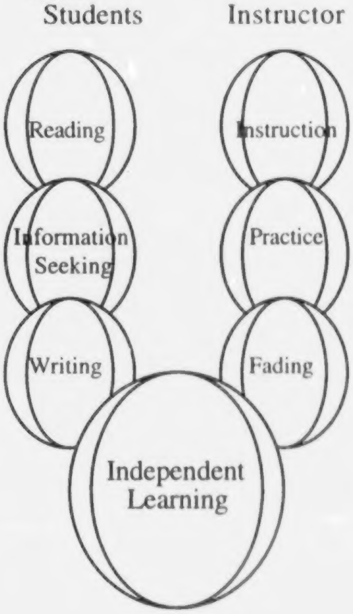
Graphic Examples

Our curriculum development was rooted in schema interactive processing, combining both top-down and bottom-up thinking, based on the power of graphics to represent thinking processes and structures of text, and focused on the direct instruction of commonly recognized graphics. As a result, two families of graphical representations were designed: top-down and bottom-up graphics.

Top-down Graphics

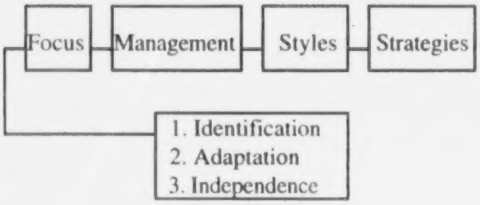
The first graphic organizer (see Figure 1) that represents the teaching-learning in the course LS 101: Learning Strategies is a top-down organizer, for it represents a model for a process, the process of becoming an independent learner.

Figure 1
GRAPHIC ORGANIZER
Chain


Students
Instructor
Reading
Information Seeking
Writing
Instruction
Practice
Fading
Independent Learning

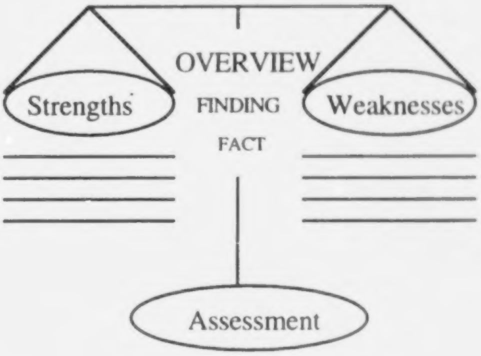
The link in the chain that represents independent learning is another process. It is pictured in the top-down planning chart shown in Figure 2. In this graphic, the characteristics of an independent learner are accompanied by the steps to follow for each of those characteristics.

Figure 2
LEARNING INDEPENDENCE
Planning Chart


Focus
Management
Styles
Strategies
1. Identification
2. Adaptation
3. Independence

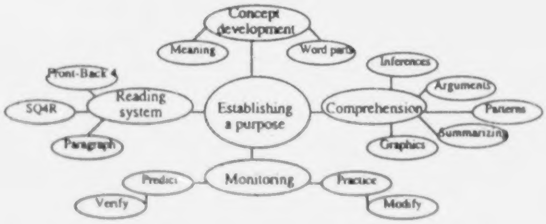
The information literacy link in the course overview graphic (see Figure 1), another top-down process, is represented by a balance scale (see Figure 3).

Figure 3
INFORMATION LITERACY
Weighing Arguments


OVERVIEW
Strengths
FINDING
FACT
Weaknesses
Assessment

One final example, the reading link in the course overview graphic (see Figure 1), another top-down process, is represented by the concept map.

Figure 4
READING
Concept Map


Concept development
Meaning
Word parts
Front-Back 4
Reading system
SQ4R
Paragraph
Establishing a purpose
Comprehension
Inferences
Arguments
Patterns
Summarizing
Graphics
Monitoring
Predict
Verify
Practice
Modify

Bottom-up Graphics

The following examples of bottom-up graphics represent the details that are identified and viewed to make a statement or represent an idea. One aspect of management (see Figure 2), student use of time, can be pictured in a pie chart (see Figure 5).

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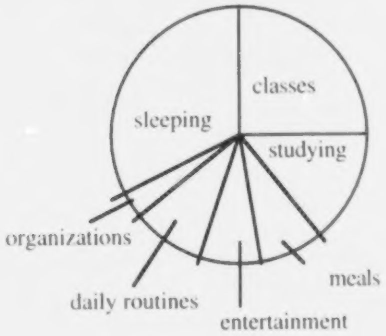
Figure 5
TIME MANAGEMENT
Pie Chart



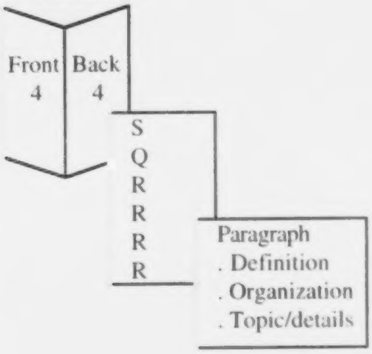
Some reading strategies guide information processing before, during, and after reading and permit the storage of knowledge as it is extracted (Sticht & McDonald,1992). The following reading strategy involves the identification of characteristics, subjects, topics, or issues. The matrix is an appropriate bottom-up graphic representation (see Figure 6).

Figure 6
READING COMPARE/CONTRAST
Matrix

	#1	#2	#3	#4	#5
Factor 1	+	+	+	+	-
Factor 2	+	-	-	-	+
Factor 3	+	+	+	+	+
Factor 4	+	+	+	+	-
Factor 5	-	-	+	-	+

After several standard graphic representations have been taught, practiced, and generalized, other graphic forms, including pictures and symbols, are introduced. For example, the graphic in Figure 7 pictures a textbook to represent the consideration of locational skills in a book, a single page for the survey method for chapters, and the narrow sheet picturing a paragraph. The dots are symbols representing the acronym DOT.

Figure 7
READING STRATEGY
Pictorial



Reading and studying with appropriate graphic organizers in mind can facilitate understanding of relationships and the recognition of critical details. Moreover, when students are guided to construct their own graphic organizers, they become more actively involved in thinking and processing text (Jones, Pierce, & Hunter, 1989). Consequently, as students read and write in the accompanying foundational studies course, they are encouraged to design and use graphic organizers in those processes.

A Fitting Conclusion

Graphic organizers are visual representations of thinking. Because making meaning while reading is an interactive process, graphics facilitated our students' thinking about thinking and understanding the relationships of ideas within text in our course. Our students identified as at-risk have benefitted according to our informal assessments of their skills and their positive journal responses that show they are generalizing their new learning. A line continuum was used as a self-appraisal of their use of strategies in literacy tasks before they received instruction and guidance in LS 101. The final response to that line continuum at the end of this term promises to be an interesting graphic display measuring their learning!

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Consumer Control Points: Creating a Visual Food Safety Education Model for Consumers

Carole B. Schiffman

Each year, foodborne disease causes millions of consumers in the United States to become ill (Archer and Kvenberg, 1985). As populations at greater risk increase (e.g., the elderly and immunocompromised patients such as those with AIDS or cancer) even these enormous numbers may rise. Food safety experts, therefore, continue to search for ways to avoid new cases of foodborne illness.

Consumer education has always been a primary consideration in the prevention of foodborne illness. Although microbes present the greatest food safety risk to consumers, they also offer the greatest opportunity for risk control. Consumers, however, must learn how to control such food safety risks. To meet this informational need, food safety educators must be provided with effective communication tools.

Current microbiological food safety education for consumers consist of a smattering of disconnected recommendations, guidelines, and points, all of which have resulted in poor communication. To carry out effective and consistent education, a framework of microbiological food safety principles must be developed, and a compatible, visual model must be designed to communicate these key concepts. This model would serve as an educational tool to visually describe basic food safety principles to consumers.

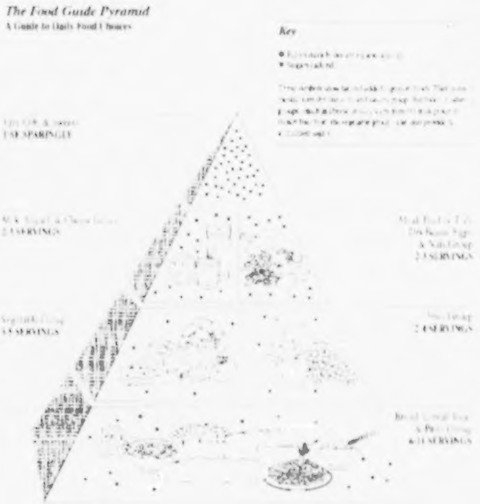
Using nutrition education and the new food guide as a procedural model, this paper offers a framework of microbiological food safety principles for the development of an informational graphic for consumers. Through this visual device consumers would be provided with a logical means to comprehend, file, store, and retrieve food safety messages for practical use and application.

Food Guides and Guidelines

Historically, food guides in the United States have translated dietary recommendations into simple nutrition education tools useful to consumers in improving and controlling their dietary intake and behavior (Light, 1981). Food guides have provided a conceptual framework for selecting the types and quantities of foods which together provide a nutritious diet (Welsh et al., 1992a). Overall, they allow foods to be classified and categorized for easy memory storage and practical use to suit dietary needs.

The new Food Guide Pyramid (Fig. 1), developed by the U.S. Department of Agriculture (USDA), is the latest attempt at communicating the principles of a balanced diet using a single visual device. With its triangular facade exhibiting separate compartments for each food group (bread, cereal, rice, and pasta; fruits; vegetables; milk, yogurt, and cheese; meat, poultry, fish, beans, eggs, and nuts; and fats, oils, and sweets), the Pyramid serves as a structured menu from which we are to select a healthful diet. It identifies relative amounts of each food group to be eaten each day, with the core of the diet located within the foundation or base, the largest area of the structure. Room for personal preferences, activity differences, and physical variation is acknowledged and allowed through ranges of servings, indicated outside the image. Recipe variations and differences in methods of preparation are reserved for more detailed companion materials.

Figure 1.
Food Guide Pyramid



This information-bearing graphic communicates the broad message of a balanced diet through the relative visual size and placement of food groups within the image. The basis of the Pyramid's broad messages is the Dietary Guidelines for Americans, developed by USDA and the Department of Health and Human Services in 1990 (Fig. 2). These guidelines contain seven principal statements reflecting current consensus on the most important dietary measures associated with reducing the risk of chronic disease in America: 1) eat a variety of foods; 2) maintain a healthy weight; 3) choose a diet low in fat, saturated fat, and cholesterol; 4) choose a diet with plenty of vegetables, fruits, and grain products; 5) use sugars only in moderation; 6) use salt and sodium only in moderation; and 7) if you drink alcoholic beverages, do so in moderation.

Together, the Dietary Guidelines and the new Food Guide Pyramid provide consistency of communication, with all nutrition messages relating back to one framework. The messages are repeated for reinforcement by using the same language,

Figure 2.
USDA/DHHS
Dietary Guidelines for Americans

- Eat a variety of foods
- Maintain healthy weight
- Choose a diet low in fat, saturated fat, and cholesterol
- Choose a diet with plenty of vegetables, fruits, and grain products
- Use sugars only in moderation
- Use salt and sodium only in moderation
- If you drink alcoholic beverages, do so in moderation

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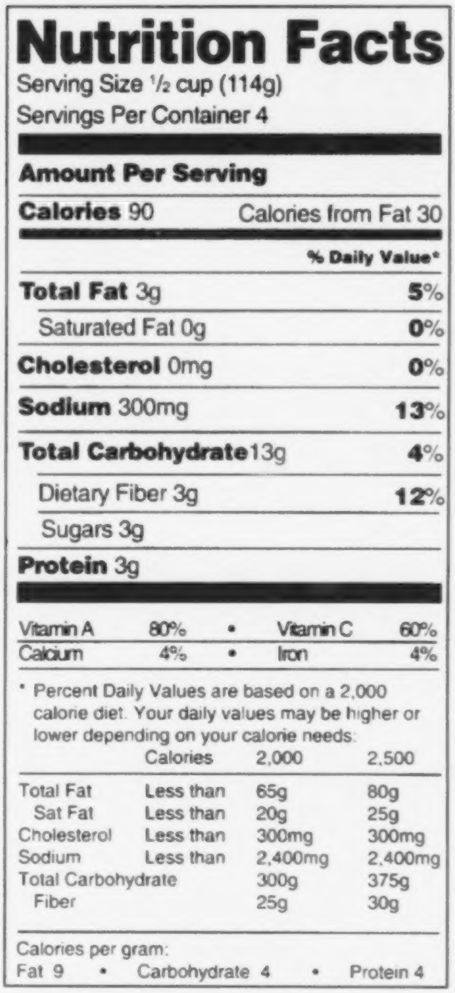
and are presented within a strong, memorable, meaningful visual device.

To assist consumers further with information and education relating to dietary management, the U.S. Food and Drug Administration (FDA) proposed mandatory nutrition labeling for all processed food products. As another communication device enabling consumers to control their health through food use, and indirectly as an educational tool, the agency developed a new food label graphic (Fig. 3). The label is carefully designed to be a highly legible table of critical nutritional information, such as caloric content, fat, cholesterol, and sodium. The new design readily communicates nutritional information relevant to the food product within the labeled package. In a sense, the food label provides usage instructions, offering information on how the consumer may apply the individual food to a healthful diet.

In other words, the Dietary Guidelines provide a framework of nutritional messages for all foods, and the Food Guide Pyramid offers a visual storage device for these messages from which the principles of a balanced diet may be stored, retrieved, and applied by the consumer, as needed. The new food label further specifies nutritional usage information by relating a particular food item within the diet to the Dietary Guidelines and Food Guide Pyramid.

Figure 3.
New Food Label



Nutrition Facts
Serving Size ½ cup (114g)
Servings Per Container 4

Amount Per Serving

Calories 90 Calories from Fat 30

	% Daily Value*
Total Fat 3g	5%
Saturated Fat 0g	0%
Cholesterol 0mg	0%
Sodium 300mg	13%
Total Carbohydrate 13g	4%
Dietary Fiber 3g	12%
Sugars 3g	
Protein 3g	

Vitamin A 80% • Vitamin C 60%
Calcium 4% • Iron 4%

* Percent Daily Values are based on a 2,000 calorie diet. Your daily values may be higher or lower depending on your calorie needs:

	Calories	2,000	2,500
Total Fat	Less than	65g	80g
Sat Fat	Less than	20g	25g
Cholesterol	Less than	300mg	300mg
Sodium	Less than	2,400mg	2,400mg
Total Carbohydrate		300g	375g
Fiber		25g	30g

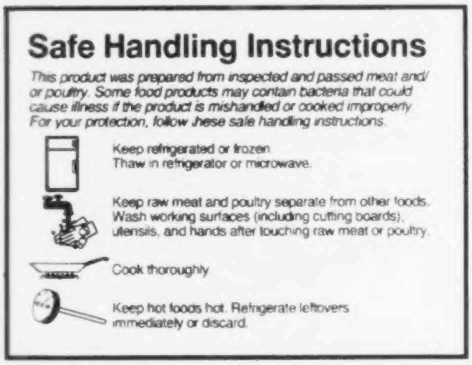
Calories per gram:
Fat 9 • Carbohydrate 4 • Protein 4

Food Safety Education

Although applied to the nutritional aspects of food since 1894 (Welsh et al., 1992a), such a comprehensive and cohesive approach to food education has never been formally applied to food safety in the United States. However, as a result of recent tragic outbreaks of foodborne illness (MMWR, 1993), consumer interest in microbiological food safety and interest by public health agencies in consumer education have both increased.

The USDA recently required safe handling labels to be placed directly on all raw and partially cooked meat and poultry products (Fig. 4). For the first time, a discrete number of critical microbiological food safety concepts are clearly identified and graphically displayed on this meat and poultry safe handling label. Four symbols are present with simple instructions: 1) an illustration of a refrigerator, carries next to it instructions to keep the product refrigerated or frozen, and to thaw in the refrigerator or microwave; 2) a drawing of soapy hands under a faucet, carries instructions to keep raw meat or poultry separate from other foods and to wash work surfaces, utensils, and hands after touching raw meat or poultry; 3) a frying pan symbol states, "cook thoroughly"; and 4) a drawing of a thermometer indicates that hot foods should be kept hot and leftovers should be refrigerated immediately.

Figure 4.



Safe Handling Instructions

This product was prepared from inspected and passed meat and/or poultry. Some food products may contain bacteria that could cause illness if the product is mishandled or cooked improperly. For your protection, follow these safe handling instructions.

Keep refrigerated or frozen.
Thaw in refrigerator or microwave.

Keep raw meat and poultry separate from other foods.
Wash working surfaces (including cutting boards), utensils, and hands after touching raw meat or poultry.

Cook thoroughly

Keep hot foods hot. Refrigerate leftovers immediately or discard.

HACCP-based educational brochure on safe food hadling, prepared for consumer use.

This safe handling label represents a significant step toward developing a cohesive set of food safety educational tools. It parallels the new nutritional food label by providing specific instructions on the use of the particular product which bears the label. Still needed for food safety education, however, is a consensus on broad microbiological food safety principles, or the equivalent of the Dietary Guidelines. In addition, a companion informational graphic, such as the Food Guide Pyramid, is needed to encompass and reflect these principles as they relate to all foods.

Hazard Analysis Critical Control Point Program

The Hazard Analysis Critical Control Point (HACCP) program is rapidly gaining wide popularity within the food industry. Applied to various segments of the industry since the early 1970s, HACCP provides a framework for implementing preventive measures where the failure to control a critical point of control can lead to an increased food safety risk (NACMCF, 1992). HACCP is based on fundamental principles of food safety, just as the Dietary Guidelines capture the principles of a healthful diet.

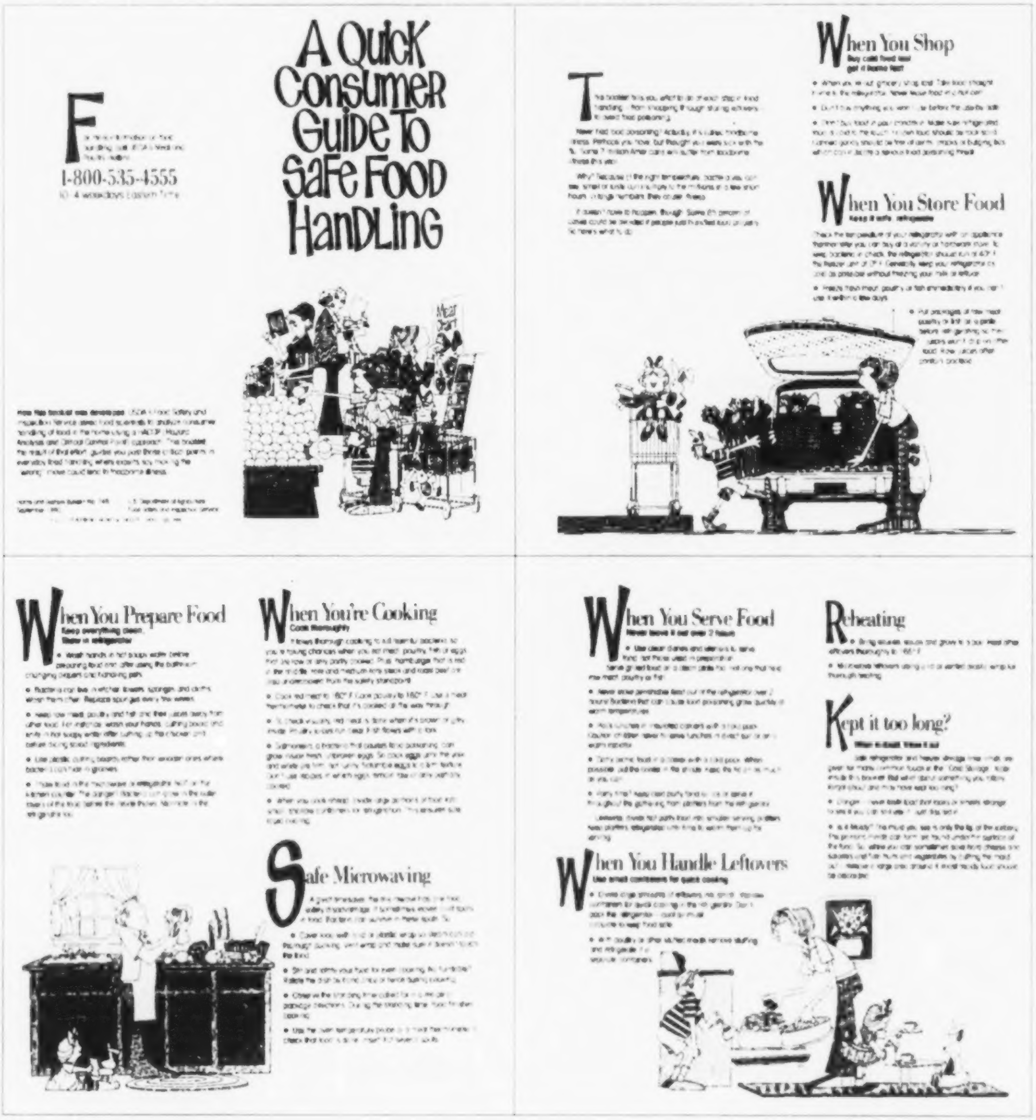
Researchers have proposed that the most effective use of HACCP for food safety would include its utilization not only throughout production, but application also in the home (Beard, 1991; Ward, 1993). HACCP is a seven-step systematic procedure that provides for identification of and preventive measures to control foodborne hazards by monitoring critical control points in the processing of foods. This approach is more complex than the consumer needs to implement at home for a good level of safety. However, an abbreviated version of HACCP could be applied in the home, using the concept of food safety guidance and a simplified version of critical points, such as holding temperature and careful handling of foods.

The booklet *A Quick Consumer Guide to Safe Food Handling* (USDA, 1990b) (Fig. 5) suggests the application of HACCP principles in the home. Recommendations are presented in standard textual format under approximately ten subheadings, which could be consolidated into a HACCP-based framework of broad principles. The meat and poultry safe handling label represents a first step in consolidation of these principles.

Redisigning the Verbal Before the Visual

As a conceptual starting point for development of a framework of food safety principles, HACCP could be redesigned into a more user-friendly concept for consumers. By reconstructing the terms used for the acronym, we can focus on what we are trying to communicate: that consumers need to take control of their food products and practices in the home, and that at certain points this is control is critical. We can then describe "who" (the consumer)

Figure 5.
New USDA Meat and Poultry Safe Food Handling Label



A Quick Consumer Guide To Safe Food Handling

1-800-535-4555

When You Shop

When You Store Food

When You Prepare Food

When You're Cooking

Safe Microwaving

When You Serve Food

Reheating

Kept it too long?

When You Handle Leftovers

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and "what" (control points) Consumer Control Points (CCP) (J. Rhodehamel, FDA, personal communication, 1992). This simplified, less intimidating, friendlier term may be easier to market.

"Do you know your
"**C**onsumer **C**ontrol **P**oints"?

"**C**onsumer **C**ontrol **P**oints:
You're in Control."

Consumer Control Points (CCP) can provide an umbrella for consumer food safety messages, which would be reflected within a single microbiological food safety graphic.

Developing a Framework

The scientific community has not yet established broad microbiological food safety principles for consumers, although some guidelines have been suggested. *A Margin of Safety: The HACCP Approach to Food Safety Education* (USDA 1990a), contains five critical control points (and a "red light, yellow light" system to denote essential and advised behaviors): 1) acquisition, 2) home storage, 3) preparation, 4) serving, and 5) handling. Although the emphasis is on meat and poultry products, it may be broadened to include all food products. A similar classification of Consumer Control Points, or the points at which microbiological hazards are likely to occur in the home might be defined as follows:

- *Purchasing.* Check containers for damages; check "sell by" dates; transport quickly.
- *Storing.* Refrigerate perishables promptly after purchasing; refrigerate leftovers promptly in shallow containers.
- *Preparing.* Thaw foods in the refrigerator or the microwave; do not cross-contaminate raw foods with cooked foods.
- *Cooking.* Cook foods thoroughly; reheat foods thoroughly.
- *Cleaning.* Wash your hands well; rinse produce; keep work surfaces clean. These five points are broad enough to be comprehensive, yet few enough in number to remember.

Key Concepts

If the approach used for developing the food guide graphic is followed, the Consumer Control Points, or food safety guidelines, must be synthesized into key concepts. For example, the seven Dietary Guidelines for Americans were organized into three key concepts: variety, proportionality, and moderation. These became the broad communication messages of the Food Guide Pyramid (Welsh et al., 1992b). They were then used to determine the graphic requirements.

- *Variety.* Present six categories, or groups of food. Grains; fruits; vegetables; milk, cheese and yogurt; meat, poultry, fish, dry beans, eggs and nuts; fats, oils and sweets.
- *Proportionality.* Present the relative amounts of the various food groups to be eaten daily and the range in the number of servings to be eaten within food groups.
- *Moderation.* Indicate the need to moderate intake of fat and added sugars within the total diet (Welsh et al., 1992b)

Our five microbiological food safety Consumer Control Points may be conceptually expressed as time, temperature, and cleanliness. In a different order of classification, the concept of relative risk puts the three concepts into context by telling when they are more or less critical. Where time, temperature, and cleanliness reflect functions that are controlled by the consumer, relative risk reflects properties of the foods that affect these functions. Compatible graphic requirements for the food safety visual would be represented as follows:

Time	Temperature	Cleanliness
Indicate that time is a critical factor in the relative safety of food, e.g., refrigerate leftovers promptly; buy perishables last; check "sell by" dates; teme is a factor in thorogh cooking	Indicate that temperature is a critical factor in food safety, e.g., cook thoroughly; refrigerate promptly do not hold foods in the "danger zone"; temperature is a factor in thorough cooking.	Indicate that hygiene and cleanliness are critical factors in food safety, e.g., wash hands; keep eqquipment and workspaces clean; and avoid cross-contamination.

Relative Risk

Indicate that different levels of risk are associated with the susceptibility of different types of foods to various bacteria or pathogens, grouped here into three categories:

Animal Proteins: (e.g., meat, poultry, seafood, eggs, milk, cheese), carry the greatest potential microbiological hazard, or require more attention with regard to safety.	Dry Foods: (e.g., dry cereals, pretzels, crackers), carry a low level of potential hazard or risk.	All Other Foods: Carry a moderate, or medium level of risk or potential hazard (e.g., fruits, vegetables, beans, potatoes).

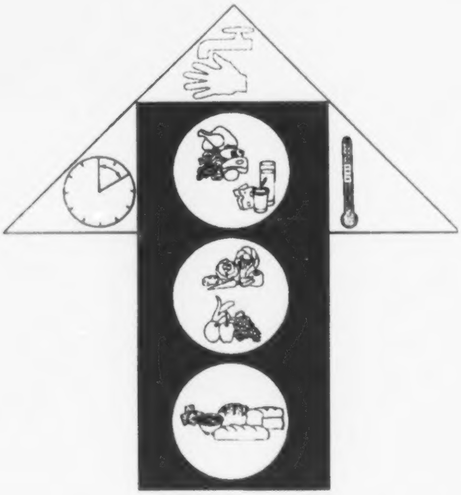
Visual Model

Based on these key concepts, the following initial attempts were made to capture and reflect them within a visual food safety education model. While they may not represent the best solution, they offer a starting point for other educators and information designers to build upon. Continuous focus group testing throughout the development of a graphic would help to create the most effective, communication messages and devices.

These symbols used to denote key concepts include: hands under a faucet to denote cleanliness; a clock with a moving arrow spanning two hours to denote time; and a thermometer to denote temperature, with a middle range "danger zone" for food handling, where bacteria grow best (40 to 140°F) shaded for cooking and refrigeration temperatures. The concept of relative risk is emphasized through relative size and location of the symbol compartments and the food groups. Stronger symbols and careful manipulation of design elements and variables, such as line, value, shape, and size should ultimately yield a more effective model.

The visual model represented by the traffic signal image (Fig. 6) contains three circles stacked within a vertical rectangle. The cleanliness, time, and temperature symbols surround the rectangle within triangular compartments located near the more risky food group, animal proteins, and touching the moderately risky group in the middle. Even without color, starting with the top circle, this image indicates red (danger or high hazard), yellow (proceed with caution), and green (proceed in a safe manner). The group of foods with the highest potential hazard is contained within the red circle; those of moderate risk, within the yellow circle, and those of lesser risk, within the green circle.

Figure 6.

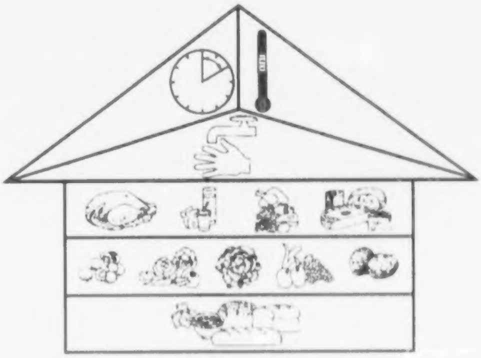


Traffic signal image containing food groups within the red, yellow, and green circles is combined with triangular canopy displaying key microbiological food safety concepts.

A benefit of this device is that because of the consumer's familiarity with the meaning of the symbol, messages can be conveyed in black and white as well as color. A drawback would be the possibility of miscommunication of messages, e.g., the red circle might imply that consumers should stop eating animal proteins or that these foods are bad in and of themselves.

Figure 7, shaped like a house, contains three tiers of risk: the top being the highest risk. The three food safety symbols are displayed within the triangles of the roof, covering all groups, and resting directly on the more risky group. Although the shape of the house communicates nothing about risk, it indicates that this information is for use within the home.

Figure 7.



House-shaped image combines three tiers of food safety risk with a traingular roof containing three microbiological food safety symbols.

General challenges include the need to communicate the concept of time and temperature as factors without stating a specific time or temperature such as 2 o'clock, 2 hours, or 145 degrees. Also, in a graphic that incorporates more than one message symbol, all message should be either positive or negative to avoid inconsistency in communication and resultant confusion.

The overall goal of using other food guidance systems has been "for the intended audience to be able to understand, remember and effectively use the system" (Cronin et al., 1987). Generally, the graphic should be as easy to reproduce in black and white as in color, and should still be readable after reduction.

Identifying appropriate messages for a HACCP-based framework and compatible, communicative images is a long process that faces many challenges. New and different issues are sure to surface with focus group testing. Meanwhile, with each challenge, we are brought that much closer to an effective solution.

Conclusion

Unlike nutrition education, which comprises a comprehensive collection of integrated tools, microbiological food safety education for consumers currently consists of a smattering of recommendations and guidelines. Such food safety education for consumers needs to be presented within a systematic framework, preferably based on the increasingly popular concept of HACCP, which could serve as a classification system for food safety principles and recommendations. A useful, effective, and memorable visual model needs to be developed to reflect these food safety principles so that consumers can learn and remember their role and take responsibility for microbiological food safety in the home. These tools will enable educators to speak as though with one voice, and more effectively and consistently communicate to consumers the critical public health principles of food safety.

The views expressed in this paper are the author's and do not necessarily represent those of the Food and Drug Administration.

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Visually Translating Educational Materials for Ethnic Populations

Carole B. Schiffman

Introduction

Population Trends

The composition of our population is changing. By 2010, the number of people over 55 will climb by 34 percent. More foreign-born people were reported entering the United States between 1985 and 1990 than in any previous five-year period since 1960 (U.S. Bureau of the Census, 1994, 1995), and results of a 1992 National Adult Literacy Survey indicated that 21 to 23 percent of adults in the U.S. demonstrate the lowest level of literacy (Kirsch, Jungblut, Jenkins, & Kolstad, 1993). Communication experts assert that this diversity, or fragmentation of the mass audience, signals the decline of mass media as a vehicle by which to reach audiences (Wilcox, Ault & Agee, 1992).

Print Materials and the Importance of Visuals

While encumbered by challenges, print materials continue to be a primary format for education materials. Unlike many new technologies, they can be easily tailored to the needs of special audiences (Zimmerman M., Newton, N., Frumin, L. & Wittet, S.)

In a society that is becoming increasingly visually oriented (Wilcox, et al., 1992) and diverse, few appreciate the critical role of visual literacy. A recognition of the need for effective and appropriate visuals in educational materials is necessary to the future success of public service education. Fragmented by the needs of a diverse population, funds no longer reach as far, and we cannot afford to waste resources on ineffective materials.

Special Needs

Each of the three growing special populations, senior, ethnic and low-literate, carries with it special needs regarding information design, and specifically, visuals. For seniors, failing sight makes issues of legibility critical, and a decreased ability to process and comprehend complex verbal information quickly can increase the importance of visual messages. For ethnic populations, differences in familiarity with and affinity for certain types of visuals can mean the difference between receptivity and irrelevance; comprehension and confusion. For verbally low-literate populations, text itself is likely to present a greater barrier than visuals, and reading difficulties make legibility important.

Educators and designers have increasingly attempted to target materials by educational level. Guidelines for the design of legible information are well documented (Paterson & Tinker, 1931; Felker, Pickering, Charrow, Holland & Redish, 1981), and recommendations for the simplification of text and visuals is widely available (Doak et al., 1985; Zimmerman, et al.,1989). However, information pertaining to design based on cultural differences of populations in the U.S. is not easily isolated from the literature.

As a result, verbal translations, as in the six brochures on the food label (see figures 1.1 through 1.6) stop short of visual translations. We have failed miserably at demographically describing and targeting our audience by visual literacy and sometimes to even recognize a difference. Yet visual messages, like verbal messages are not inherently self-explanatory (Fugelsang, 1973; Wileman, 1991) nor are they necessarily cross-culturally appropriate. What is needed in information design today are guidelines for designing or evaluating visuals for those who are culturally "differently visually literate" from the dominant population; not just a simplification of information.

Comprehension and Preference

A recognition as well as appreciation of visuals can be dependent on familiarity (Crone & Moos, 1991). Recognition of images does not guarantee comprehension (NDS, n.d.; Wileman, 1991) and comprehension does not guarantee preference.

Nely Galan, president of a new entertainment business targeted toward the Hispanic market, notes that Latinos are part of a distinctly different visual culture from other Americans (Garcia, 1994). Such differences must be taken into account for each audience. She claims that "[Latinos are] a status-oriented society, and to Latin Americans black-and-white equals flea market. In the U.S., you can launch a whole channel of black-and-white movies and call it American Movie Classics."

Purpose and Objectives

While information design guidance for low-literate populations usually addresses issues of cultural sensitivity to a limited extent, the emphasis is largely on simplification rather than adaptation. On the other end of the spectrum, designers of visual materials in developing countries may be attentive to cultural differences (Moynihan & Mukherjee, 1981; Rana, 1990; Zimmer & Zimmer, 1978; Zimmerman, et al., 1989), but guidance is generally meant for working with pictorially low- or even il-literate populations. They fail to directly address the needs of the ethnic people in a new culture.

This paper identifies guidelines for designing and evaluating visual components of educational materials for ethnic populations in the U.S. Relevant principles from related research with verbally low-literate populations in developed countries and visual literacy in developing countries will be used as a basis for the guidelines.

Food safety, nutrition and related health materials have been cited as examples within the text, as the nature of my work at the U.S. Food and Drug Administration (FDA) offers me good access to them.

To supplement this review, results from focus group tests on materials developed for an ethnic population in the U.S. are cited.

Figures 1.1–1.6

1.1
1.2
1.3
1.4
1.5
1.6
READ THE LABEL

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Concurrent with a growing need for culturally relevant materials in the U.S., developing countries have increasingly requested assistance from the U.S. in food safety education as they institute food control systems. In response, a review of food safety educational materials for ethnic populations in the U.S. and for consumers in developing countries was conducted to see if such materials could be adapted and shared to meet the needs both, of refugees in the U.S. and consumers in developing countries.

It should not be implied from this paper that every project need address every visual translation guideline, but that designers should be aware of visual blunders, and following some guidelines may facilitate communication cross cultural bounds. They may be seen as "red flags", or reminders, for editing purposes. Certain guidelines will be more important at certain times. Rana (1990) claims that a guide with broad generalizations, or instructions for adaptations of visuals to incorporate local variations and educational levels, can be developed and used to save project time, resources and money. I hope to provide a kernel of what could be used as such a guide.

Research

Literature Review

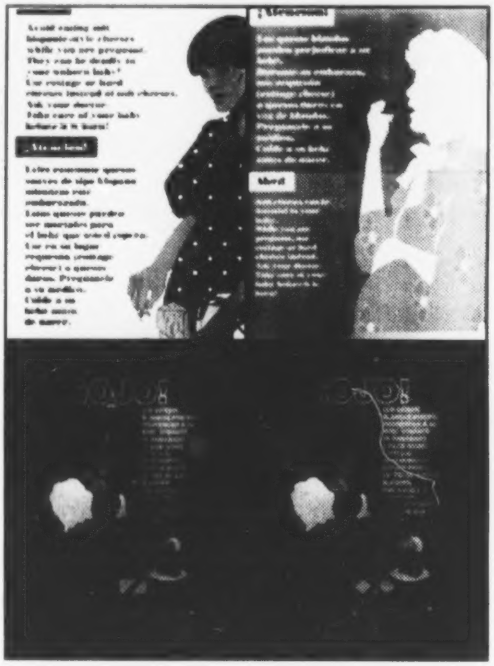
A literature search was conducted to identify research relating to visual communication and ethnic populations. Information retrieved focused primarily on developing health education materials for low-literate audiences (especially in the U.S.) and developing visual health education materials in developing countries.

Focus Group Tests

A series of focus group tests during development of a poster for Mexican-American women were performed by the FDA in 1992. Eight metropolitan areas across the U.S. and in Puerto Rico served as sites for approximately 200 respondents.

Initially, eight posters illustrating the following message were designed. Most of these designs, however, were eliminated prior to testing based on many of the principles identified in this paper. Four new variations were subsequently designed and tested (see figures 2.1 through 2.4). These posters varied in image content, colors, symbols, layout, etc. Differences in text, language, headings, and the display of English and/or Spanish text were tested as well.

Figure 2.1–2.4



Although materials for this project were not translated, but designed directly for the Hispanic population, the study is relevant to this paper in that over twelve variations were produced before identifying (the components of) one that was likely to be successful. This excercise in revisions highlights the need for cross-cultural design guidelines.

Materials Search

Over fifty organizations were contacted to request educational print materials (posters, brochures, pamphlets, flyers, booklets) on food

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safety and related subjects for ethnic populations in the U.S. and for consumers in developing countries. These were reviewed and compared for similarities and differences (FDA comparative study).

Findings and Guidelines

Symbols and Codes

Representations of images, concepts and actions are based on pictorial conventions. Fugelsang (1973) states that such conventions are abstract symbols and therefore, not necessarily intercultural. Interpretations are learned. If there is a difference between the codes of the creators of the signs (i.e., simplicity equals elegance) and the codes of the consumers of the signs (i.e., bright colors, gaudy, busy designs equals high class) there will be poor communication. (Berger, 1984, pp. 42-3)

Dichter (1964) differentiates between three types of symbols: *connotative symbols* are recognizable objects with both manifest and latent meanings, such as the depiction of a middle priced car in an upper class ad. *Interpretive symbols* invite interpretation.... and are concerned with deeper feelings (pp. 443-44). *Intentional symbols* are obvious symbols consciously and conventionally accepted by the population.

With the exception of color, which was too difficult to classify as one type of symbol, variables are discussed under one of these symbol classifications.

Color

Color is both an artistic attribute as well as a symbol with associated meanings. Preferences may be dependent on cultural and social backgrounds (Moynihan & Mukherjee, 1981; NDS, n.d.; Pett & Burbank, 1991; Rana, 1990; Zimmerman et al., 1989; Zimmerman & Perkin, 1982), and may be influenced by sex, culture, geography, and other demographic aspects of the target audience (Berryman, 1990). Affinity for certain color combinations was evident in FDA focus group tests: pastels were preferred to dark colors and bright colors, as in figures 2.3 and 2.4, were preferred to both dark or pastel colors.

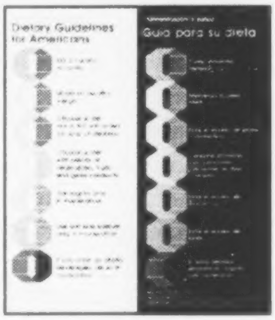
When unsure about what colors to use, it is best to use true to life colors (NDS, n.d.; Rana, 1990), especially when rendering skin color. For example, in India, black and yellow are the colors of a dead body (Moynihan & Mukherjee, 1981). One draft poster from the FDA study, used a skin tone which was too "gray". It was rejected in preliminary one-on-one research.

Intentional Symbols

Decorative

Guard against the use of random and noncommunicatve symbols, such as those which distract from rather than facilitate communication (Griffin, Pettersson, Semali and Takakuwa, 1995). The double-helix type design of the dietary guidelines in figures 3.1 and 3.2 is an example of a symbol which seems random.

Figures 3.1 and 3.2



Literal

Comprehension or preference for such symbols as crosses, arrows, checkmarks, skulls and cross bones, conversation balloons, etc. should be assessed (Rana, 1990; Zimmerman, et al., 1989; Zimmer & Zimmer, 1978). They are sometimes taken for granted as universally understood or typically used (NDS, n.d.). The skull and crossbones, taken from pirate tales

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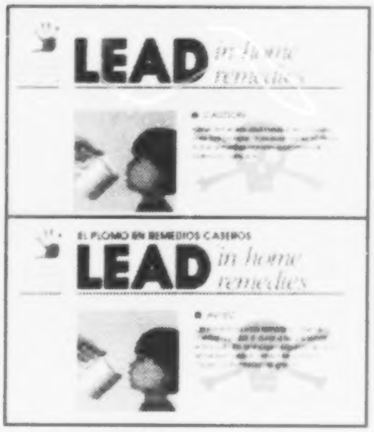
(Morgan & Welton, 1992) has failed in tests in other cultures. Still, we see them used liberally across cultures, as in the lead prevention materials in figures 4.1 and 4.2. In the FDA focus group tests, there was a slight preference for the "X" symbol, rather than the circle with a line through it, though both were understood.

Figures 4.1 and 4.2


LEAD in home remedies
CAUTION
EL PLOMO EN REMEDIOS CASEROS
LEAD in home remedies

Text Within Visuals

English text incorporated within the visuals., as in the health fraud brochures in English, Spanish, Chinese, and Korean (see figures 5.1 through 5.4) will not only limit communication, but the English becomes an element of design which readers may view as unfamiliar and irrelevant.

Connotative Symbols

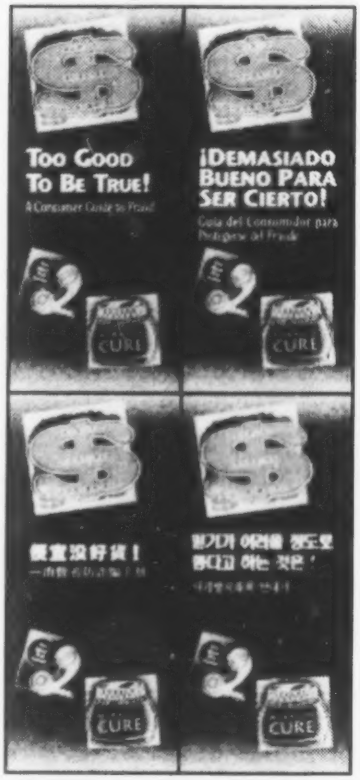
Concepts

The *Quackery* brochures in (figure 6.1 and 6.2) represent a conceptual image; a certain type of black hat upside down connotes to Americans that it is a magician's hat. Magic further implies trickery, which is, in the U.S., synonymous with quackery and fraud. The question is, does this concept translate across cultures?

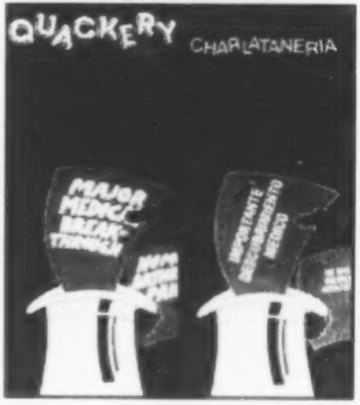
Associative Meanings

In the series of brochures on lead poisoning prevention, figures 7.1 and 7.2 use an image of the facade of a house on the cover. However, this particular architectural style may not be familiar among an ethnic population. Also, the palladium window may be a symbol of an expensive house unlikely to be prevalent in neighborhoods of refugees and immigrants.

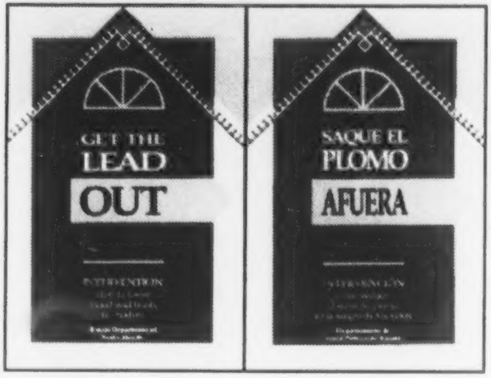
Figures 5.1–5.4


Too Good To Be True!
A Consumer Guide to Fraud
¡Demasiado Bueno Para Ser Cierto!
Guía del Consumidor para Protegerse del Fraude
CURE
CURE
CURE
CURE

Figures 6.1–6.2


QUACKERY
CHARLATANERIA
MAJOR MEDICAL BREAK-THROUGH
IMPORTANTE DESCUBRIMIENTO MEDICO

Figures 7.1–7.2



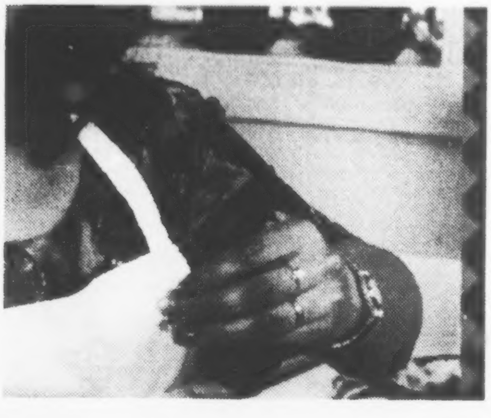
Typestyle

Type carries with it meaning in the style, layout and printing. Tomaselli and Tomaselli (1984) chose to use letraset letters instead of handwriting for their media graphics on breastfeeding in a developing country. They recognized that, to their audience, this gave the material a professional look, appealing to mothers.

Cultural Norms

Cultural norms, beliefs and customs should be reflected properly in the message and design (Rana, 1990; Rice & Valdivia, 1991). For example, in figure 8 from the FDA field tests, care is taken to show the pregnant woman's wedding ring. Within the Hispanic culture, family is very important, and the fact that the woman is married may be important to communicating a message about pregnancy.

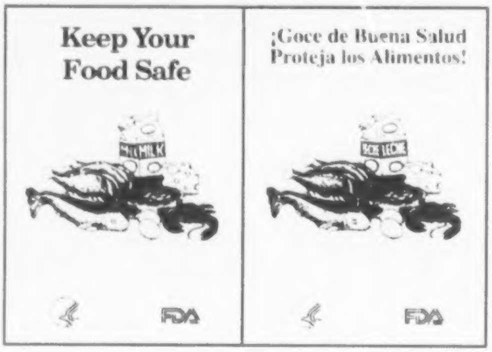
Figure 8



Localizing materials means utilizing the local material culture within the image, and specifically, familiar items and objects (McBean, 1989; Pettersson, 1993; Zimmer & Zimmer, 1978; Zimmerman & Perkin, 1982; Zimmerman et al., 1989). Showing details that are not part of their culture, means they may not see the materials as having relevance to themselves (Moynihan & Mukherjee, 1981).

For example, the foods shown in the Spanish version of *Keep your food safe* (figure 9.1) should be changed to reflect more culturally appropriate foods, rather than retaining the same choices as the American version (figure 9.2).

Figures 9.1 and 9.2



One of the most conspicuous subject differences reflected by the FDA study comparing U.S. materials to those of developing countries involved variations in environmental settings. Materials from developing countries frequently incorporated outdoor settings with nature in the background, as in figure 10, from India. Plumbing may not exist, handwashing and latrine usage often take place outside, as does procurement and even preparation.

In comparison, U.S. materials were typically set in internal environments, kitchens and other parts of the interior (see figures 11 and 12 for Hispanic Americans) and were completely devoid of nature. These are examples of the types of visual issues based on lifestyle which become relevant when adpating and sharing materials.

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Figure 10

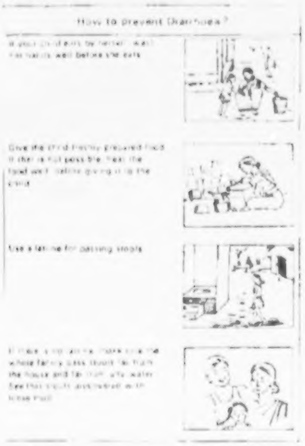
How to prevent Diarrhoea?
Use a latrine for passing stools

Figure 11

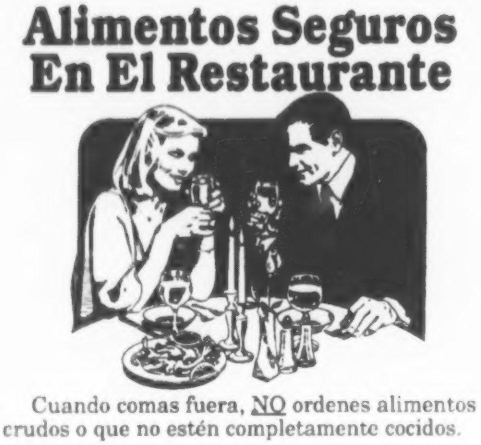
Alimentos Seguros
En El Restaurante
Cuando comas fuera, NO ordenes alimentos
crudos o que no estén completamente cocidos.

Figure 12

Social Expressions,
Body Language and Gesture

Gestures, facial expressions, posture, and personal space may vary across cultures (Morgan & Welton, 1992). They may not necessarily universal in the way they are interpreted and received (McBean, 1989; Zimmerman & Perkin, 1982; Zimmerman, et al., 1989). Body language, such as the way we stand, walk, and sit can be interpreted differently by different cultures (Zimmer & Zimmer, 1978).

Lifestyle

Images should represent everyday situations for the audience (Rice & Valdivia, 1991; Zimmerman, et al., 1989). For example, the image of the couple dressed for a candlelight dinner in a fine restaurant in figure 11 is unlikely to be a typical situation for a new refugee.

The need to show the correct people in the correct roles was observed in studies in Africa where the importance of the grandmother as a family figure was undermined by depicting her as giving incorrect advice (Tomaselli & Tomaselli, 1984). Zimmerman & Steckel (1985) found that the image of the back of a man sitting in a contraceptive clinic was distracting to women. This is identified as "extraneous" detail but is really "inappropriate" detail. In other words, would the back of a woman have been distracting?

In the FDA focus groups, respondents were asked whether they would prefer to see the pregnant woman with her husband or without. They chose to depict her alone. The women may have viewed pregnancy as a woman's issue.

Images must also be in line with what people believe and understand within their culture. In the FDA comparative review of materials, the entire conceptual approach to food safety differed. Developing countries primarily focused on "disease" — specifically, causes and prevention; U.S. materials focused on "safety" — how to keep food safe. Whereas one is about maintaining the quality of a product, the other is about avoiding the harmful impact of a product upon the individual. These disparate approaches may reflect principal needs of the regions and existing knowledges, beliefs and experiences. For example, in

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developing countries, consumers do not have an understanding of "safe" as it relates to food (FAO, 1993). When food control is not reliable, disease management may be a reality.

Such differences will influence and often even dictate which images and visual messages are appropriate and relevant, and can become important considerations when materials are adapted for other cultures.

Facial Recognition

It is important to depict people with whom the viewer can identify (Doak, 1985). In the materials in figures 13.1 through 13.4, it is logical that the same baby cannot look Vietnamese, Portuguese, Haitian, etc., at the same time. Respondents in the FDA focus group tests felt that the woman in figure 2.1 did not look "Hispanic". But it is not always easy to depict what we believe a person from the culture looks like. The dangers range from depicting people with whom our audience do not identify to stereotyping people.

Stereotypical Images

Avoid stereotypical images that do not relate to the content of the material. Do not use decorative images without researching their proper use and meaning or inadvertently use the images and designs in a stereotypical way.

Interpretive Symbols

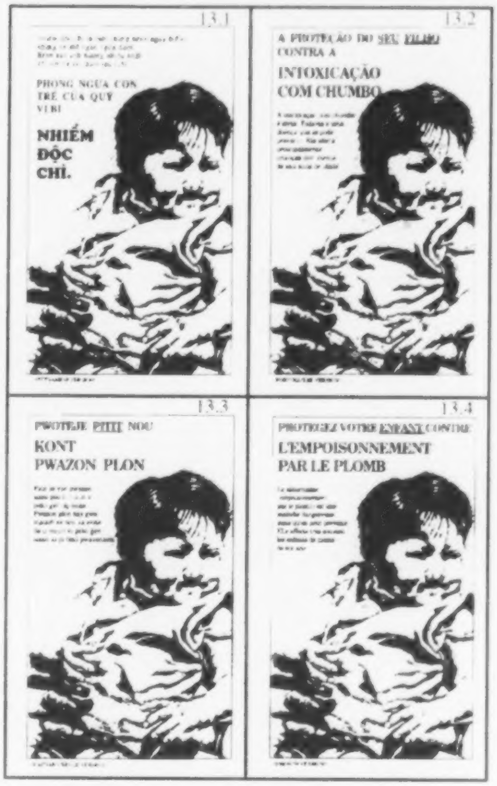
Visual Dialect

Visual elements create a feeling independent of meaning that resonates with the viewer. The socially or culturally influenced visual language (color, line, shape, value, etc.) is the "visual dialect". It reflects, describes, and expresses the social and cultural visual world of the audience, making a piece familiar and comfortable (Schiffman, 1995).

Style

Each culture has its own art and graphics (Zimmerman & Perkin, 1982). Adults in some parts of Asia best understand shaded line drawings; silhouettes may be better in certain African communities; and photos may be more effective in countries where photonovelas are used, such as Mexico .

Figures 13.1–13.4


13.1
PHONG NGUA CON TRẺ CỦA QUÝ VỊ BỊ
NHIỄM ĐỘC CHÌ.
13.2
A PROTEÇÃO DO SEU FILHO CONTRA A
INTOXICAÇÃO COM CHUMBO
13.3
PWOTEJE PITIT NOU
KONT PWAZON PLON
13.4
PROTEGEZ VOTRE ENFANT CONTRE
L'EMPOISONNEMENT PAR LE PLOMB

In the FDA comparison of materials, cartoons were not used in the U.S. but were used in some developing countries. There may be some avoidance by illustrators in the U.S. to use cartoons, as they are often perceived as children's art. However, this may not necessarily be so in every population. (Silbermann & Dyroff, 1986, p. 7) Still, appropriate style cartoons should be used at appropriate times. For example,photonovelas are often associated with soap opera-type media, and may be appropriate for issues involving love and sex, such as contraceptives or AIDS, but not for food.

Realism and Abstraction

Abstractions are often culturally specific and inherently require a greater level of interpretation than realistic artwork. Stylizations and abstractions represent artificially determined depictions of objects or messages. However, in the FDA comparative study of materials, U.S. materials tended toward flat, stylized, abstract images.

Silhouetting

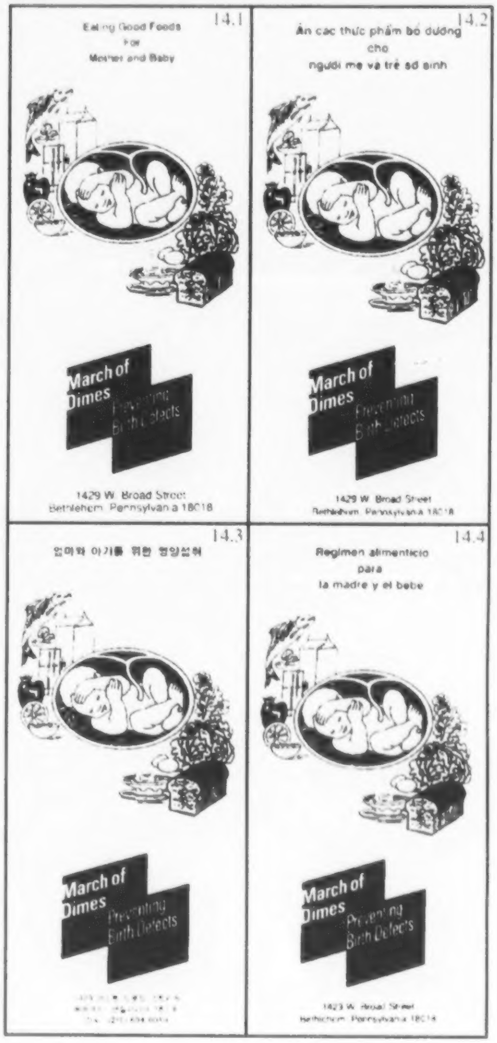
Silhouetting is a common technique among U.S. designers, where they are regarded as slick and simple. Yet they can be interpreted in complex ways. A UNICEF study among villagers in Nepal showed that silhouettes were thought to represent a black person, a monster, a devil or a ghost (NDS, n.d.). In the FDA field tests with Hispanic-Americans, shadow silhouettes, as in figure 2.2, were identified with the devil. They did not appreciate this being linked to pregnancy or to the baby. Respondents were also disturbed by "faceless" faces, as in figure 2.3, and by faces in profile that showed one eye, as in figure 2.4 as these were thought to imply that they had something to hide.

Context vs. Confusion

Depicting parts of images out of context, such as isolated parts of the body, should be used cautiously (Doak, et al., 1985; Moynihan & Mukherjee, 1981; Rana, 1990; Zimmerman et al., 1989). For example, series of brochures in figures 14.1 through 14.4 for English-speaking, Vietnamese, Korean, and Puerto Rican groups may not be a universally conventional way of depicting a baby in utero. Generally, it is best to retain detail which is not distracting (McBean, 1989; Pettersson, 1993; Rana, 1990; Zimmerman, et al., 1989), but puts the image in context (Moynihan & Mukherjee, 1981; Zimmerman & Perkin, 1982).

Visual Syntax

The relation of the picture's visual elements to each other is visual syntax (Zimmer & Zimmer, 1978). It can encompass scale, dimension, time, motion and change. Browsing through magazines for Hispanic audiences, a cultural affinity for certain visual syntax is apparent. There is a busy-ness and boldness in Hispanic printed material, which Nely Galan recognizes and captures in her work (Garcia, 1995). Arrangement and organization can also be defined by symmetry or grids (Zimmer & Zimmer, 1978).


14.1
Eating Good Foods
For
Mother and Baby
March of Dimes
Preventing Birth Defects
1429 W. Broad Street
Bethlehem, Pennsylvania 18018
14.2
Ăn các thực phẩm bổ dưỡng
cho
người mẹ và trẻ sơ sinh
March of Dimes
Preventing Birth Defects
1429 W. Broad Street
Bethlehem, Pennsylvania 18018
14.3
엄마와 아기를 위한 영양섭취
March of Dimes
Preventing Birth Defects
14.4
Regimen alimenticio
para
la madre y el bebe
March of Dimes
Preventing Birth Defects
1429 W. Broad Street
Bethlehem, Pennsylvania 18018

Figures 14.1–14.4

Sequence

Messages should be arranged in a sequence that is logical and preferred by the audience. Viewers may be used to reading in another language which follows a different direction, such as Arabic or Chinese (Doak et

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al., 1985). Where photonovelas are popular, sequencing conventions may already exist.

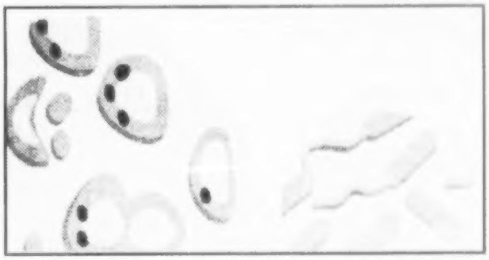
Perspective

Vanishing point perspective is a European-constructed convention (Fugelsang, 1973; Morgan & Welton, 1992; Rana, 1990; Zimmer & Zimmer, 1978). Asian art and classic Egyptian art are good examples of differences in representation of perspective. The use of such different pictorial conventions may not mean that only one is understood, but rather that one is more familiar and comfortable than another.

Scale

Objects depicted way out of scale, especially smaller to larger, such as insects or germs as in figure 15, can be misconstrued or confusing (Moynihan & Mukherjee, 1981).

Figure 15



Framing

All pictures show three dimensions in two and crop the view at arbitrary borders (Zimmer & Zimmer, 1978). Images may be contained within frames on the page, may have no frame, or may bleed off the page.

In the FDA comparative review of materials, differences in framing were evident. Visual scope in developing countries tended to be more inclusive, illustrated within the context of part of a scene, or at least included the hands of a person, as in figure 16 from El Salvador.

U.S. materials more often contained isolated images of specific foods or actions, not set within a scenic context, showing foods independent of human interaction , as in figure 17. Again, this may reflect the fact that processing is primarily done in commercial plants, and the consumer's role in food handling is diminished.

Figure 16

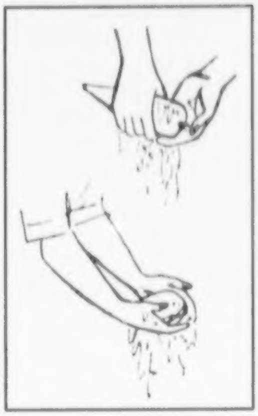
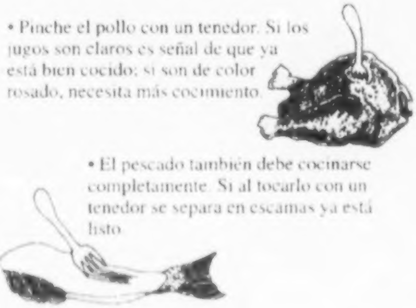


Figure 17



• Pinche el pollo con un tenedor. Si los jugos son claros es señal de que ya está bien cocido; si son de color rosado, necesita más cocimiento.

• El pescado también debe cocinarse completamente. Si al tocarlo con un tenedor se separa en escamas ya está listo.

Layout of Text

When text is translated into other languages, word length changes (Spanish is longer) and layout and design must be adjusted to accommodate any additional clutter of text.

Conclusions

Visually translating health educational materials will be critical to the success of communication efforts, particularly as our population continues to change ethnically and less developed countries continue to develop. By understanding the types of issues which become relevant when designing materials across cultures, we can avoid communication blunders and repeated field tests. We can more accurately evaluate the potential success of existing materials among different cultures and edit design elements based on reason, rather than personal taste.

This study leaves a number of areas open for future research. Comparative empirical tests of performance based on visually untranslated versus visually translated educational materials should be done. It would also be interesting to find out how visual culture changes and is adopted by ethnic populations. Do they retain certain aspects of visual culture more fervently than others? Which types of symbols are adopted first — intentional, connotative or interpretive? Are interpretive symbols as important as intentional symbols to the success of the communication effort? Finally, visual literacies are continually in transition, and exposure to and adoption of new media and media styles is inevitable. Absorption of the new culture is unlikely to be linear or predictable, but rather erratic and selective. How do people reinvent, as a group, new types of cultural expressions of the old world view within the new?

Visual translation needs will continue to become more important as our population continues to change. New populations will always carry greater demands for public service education. The more effective our communication efforts are, the greater our impact will be.

The views presented in this paper are solely the views of the author and do not necessarily represent those of FDA.

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The 3-D View of Authentic Assessment

by Sylvia Smith, Jacqueline Layng & Marshall Jones

Introduction

Today the general public is demanding to know *what* and *how* students are learning. Schools are being faced with issues of accountability regarding student performance unlike any they have had to deal with in the past. How student achievement is assessed has become a hotly debated topic. Student achievement and performance in the classroom is being closely scrutinized to ensure that students are indeed learning. The concern is that our students are failing to learn and/or transfer skills in critical thinking, problem-solving, and reasoning to real-world situations. This has made our educational community rethink *what* is taught, *how* it is taught, and equally important, *how* it is assessed.

Abraham Kaplan, according to Farr and Greene (1993), felt that educational emphasis in assessment should be concerned "with assessment that helps us to understand rather than to merely rank and label" (p. 23). Teachers need, assessment data that will help them to improve the classroom curriculum which, will help them to improve student achievement.

In order to acquire accurate and useful information concerning student performance, teachers are turning away from the traditional summative evaluation methods toward a formative method of assessment. This method of assessment is known as *authentic assessment, alternative assessment,* and *performance-based assessment.* These terms are often used interchangeably, however they are not the same. According to Marzano, Pickering, & McTighe (1993) authentic assessment, popularized by Grant Wiggins (1989), conveys the idea that assessment should engage students in applying knowledge and skills in the same way they are used in the 'real world' outside of school (p.13). Alternative assessment applies to the variety of assessments that differ from the multiple-choice, timed, one-shot approaches characterized by most traditional standardized and classroom evaluation methods. Finally performance-based assessment according to Marzano, Pickering, & McTighe (1993) is a broad term, encompassing many of the characteristics of both authentic assessment and alternative assessment (p.13). The authentic assessment process that will be addressed in this paper requires heightened observational skills by the teacher/researcher.

In order to verify student progress, teachers must be able to identify and document key observable tasks occurring within the curriculum. However, many teachers may not possess the training or confidence to implement observational methodology in the assessment process.

The use of qualitative observational methodology is a key to increasing the effectiveness of the authentic assessment process. In qualitative methodology, the "observer is the instrument" (Patton, 1987, p. 12) which is used to carefully examine trends or patterns while emphasizing "the importance of the *meaning* of human behavior and the social-cultural context of social interaction" (et al., 1987, p.20). The integration of qualitative observational methods can help provide teachers with the pedagogical framework in which to improve the accuracy, validity, and reliability of the authentic assessment process.

Observation of student performance is a critical component of the authentic assessment process. This paper focuses on a systematic method of addressing this issue through processes referred to here as the "The 3-D view of authentic assessment".

First Dimension - what is to be assessed?

Prior to the implementation of any form of assessment, a clear understanding of *what is to be assessed* is necessary. This includes a fundamental understanding of the purpose of the assessment process, the learner, and the subject matter to be taught.

If the primary purpose of the assessment is to "describe the extent to which students have attained particular knowledge and skills, your assessment should focus on the outcomes or product of student learning" (Herman, Aschbacher, Winters, 1992, p.23). "However, if your purpose is diagnosis and improvement, such as diagnosing a student's strengths and weaknesses, prescribing the most appropriate instructional programs, or identifying strategies students use well and those they need help with, you'll want an assessment that gives you information about the process as well as the outcome" (et al., 1992, p.23).

Understanding and recognizing the uniqueness of learners and their learning styles is an important step in the assessment process. The multiple intelligence theory, advanced by Howard Gardner (1983), espoused a shift in philosophy in which the assessor recognizes the framework of intelligence based on a broad range of abilities. The potential of all learners should be fully explored and supported by the teacher/assessor in order to maximize the learning experience.

Finally, a clear understanding of the subject matter is a necessary step in the assessment process. Without a clear understanding of the subject matter, determining important learning outcomes would be a difficult, if not an impossible task.

Second Dimension - how is it to be measured?

Determining clear and educationally sound learning outcomes is a major step in the assessment process. Well- constructed learning outcomes establish a strong foundation for prioritizing and creating a well-formulated rubric. A rubric is a rule of procedure. "When the word is used in connection with assessment, a rubric is a scoring guide that differentiates, on an articulated scale..." (Jasmine, 1993. p.9). There are two kinds of rubrics, holistic and analytic. According to Jasmine (1993), a holistic rubric is used to measure the overall effect of a task and is qualitative in nature. An analytic rubric, consists of score points assigned to various elements and is quantitative in nature.

Setting the criteria and standards of the rubrics is a main component of authentic assessment. "Perhaps most important, scoring criteria make public what is being judged and, in many cases, the standards for acceptable performance. Thus, criteria communicate your goals and achievement standards" (Herman, Aschbacher, Winters, 1992, p.44).

Selecting the task to match the authentic assessment is also a crucial point in the assessment process. Aligning the assessment task with the intended outcomes should be done to ensure that the assessment can in fact measure the learning to take place. "When considering assessment tasks, your best choices are those you believe most closely target your instructional aims and allow your students to demonstrate their progress and capabilities" (Herman, Aschbacher, Winters, 1992, p.33). Herman, Aschbacher, Winters (1992) posed six questions to help educators choose good tasks. The questions are as follows:

- Does the task match specific instructional intentions?
- Does the task adequately represent the content and skills you expect students to attain?
- Does the task enable students to demonstrate their progress and capabilities?
- Does the assessment use authentic, real-world tasks?
- Does the task lend itself to an interdisciplinary approach?
- Can the task be structured to provide measures of several goals? (p.35-37)

Choosing an appropriate task must then be followed by describing the assessment task in a manner that is clear and documentable in order for others to replicate and/or interpret your finding. Finally, Herman, Aschbacher, Winters (1993) offer a set of criteria that help to ensure that the appropriate learning tasks lead to sound assessment. These criteria are as follows:

- Do the tasks match the important outcome goals you have set for the students?
- Do they pose an enduring problem type, the type of problems and situations that students are likely to face repeatedly in school and their future lives?
- Are the tasks fair and free of bias?
- Will the tasks be credible to important constituencies?
- Will the tasks be meaningful and engaging to students so that they will be motivated to show their capabilities?
- Are the tasks instructionally related/teachable?
- Are the tasks feasible for implementation in your classroom or school in terms of space, equipment, time, costs, and so forth?. (p. 41-43)

Third Dimension - interpreting verbal & non-verbal messages or data

The assessment process is a matter of the verification of student learning. In the authentic assessment process, students are engaged in authentic and meaningful tasks. According to Wiggins (1993), the assessment process is authentic when we directly examine student performance on worthy intellectual tasks (p. 3). Therefore, the reliance on sound first-hand observation of both verbal and non-verbal learning situations is a vital component in authentic assessment. Teachers involved in authentic assessment need to develop strong observational skills. Harp (1991) discusses observation as a powerful tool for the evaluation of students as they are engaged in the performance of *real world* tasks (p. 75).

First-hand observation provides an understanding of both the activity and the context in which the activity is performed. It allows the observer to make more reliable inferences concerning the performance activity. Better understanding and reliable inferences are a direct result of the observer's ability to concentrate on worthy intellectual tasks in order to evaluate the performance activity more clearly.

The ability to interpret verbal and non-verbal messages accurately, validly, and reliably through the observation of learning situations requires particularly careful analysis and judgment on the part of the observer. The value of observational data is developed through the observer's descriptive documentation of the setting, the activities, and meaning of what was observed.

Critical Viewing

The teacher has always been a critic to some extent, but are teachers critical viewers as well? According to James Brown (1991), "The critic, and the critical viewer, must be grounded in two essential areas of this act of critical judgment: the area of facts (what is informational data) and the area of norms or standards (what ought to be criteria)" (p. 24). Thus, teachers are critical viewers by nature, but most likely not by systematic process.

Traditionally, critical viewing has involved the interpretation of verbal and non-verbal information involving some form of media such as movies, photographs or television. The process of critically viewing performances involving human action has not been adequately addressed through research. Perhaps this is because no critical viewing model exists to guide teachers in systematically assessing their students. This paper attempts to fill that gap by building a critical viewing model to train teachers to become skilled critical viewers. As Ploghoft and Anderson (1982) stated, "individuals trained in critical viewing skills will be equipped with criteria for evaluating intention, motives, and audience response (students), for assigning value or worth to the message" (p. 5). However, before creating a critical viewing model for teacher researchers, it is important to understand how and where critical viewing skills developed.

Critical Viewing Background

Critical viewing skills evolved from critical reading skills in order to better analyze electronic mediated messages. As John Long (1989) observed, "much of the groundwork for critical viewing was derived from work in critical reading. In critical reading, individuals learn procedures to extract and assimilate from the print media" (p. 12). Critical viewing follows a similar process but involves electronic media. As society and media became more sophisticated, the need to understand how information was interpreted through electronic media grew.

Several projects and studies were conducted to analyze and develop standard critical viewing skills for elementary, middle school, high school and adults students. The elementary project was conducted by the Southwest Educational Development Laboratory, WNET a public television station in New York published the middle school segment, the Far West Laboratory in San Francisco developed the high school study and Boston University's School of Public Communications developed the adult program. The project's goal was to assist individuals in monitoring their own viewing habits; in other words, to teach people to view television from a perspective other than that of the medium.

Further studies conducted on critical viewing since 1970 include: Idaho Falls school District Project, the National Education Association, the National PTA and the American broadcasting Companies (ABC). The bulk of these critical viewing studies were directed toward creating higher awareness levels in viewers. Increasing one's level of critical awareness has the potential to move the viewer from passive information processing to active information processing.

There have been many different sets of skills developed for various mediated situations and targeted at certain age levels. For example, the Southwest Educational Development Laboratory defined critical viewing skills as the ability to distinguish program elements, make judicious use of viewing time, understand the psychological implications of advertising, distinguish fact from fiction, recognize and appreciate differing views, understand content of dramatic presentation, understand style of dramatic presentation and understand the relationship between television and the printed word (Brown, 1991, p.96). Although a general standard of critical viewing skills is difficult to identify, the majority of projects and studies share the concept that people must not be passive consumers of information because they lose the ability to understand the world from varied perspectives. Adams & Hamm (1988) observed, "Intelligent consumers of video information need to be able to sort out the meaningful from the trivial" (p. 82). This is also true of any viewing situation, be it mediated or live. In the age of information, how one views life can help or hinder understanding reality. Thus, critical viewing is more than understanding mediated messages. It is understanding all types of messages from mediated to live. As Adams & Hamm stated, "Effective viewing of real world images requires a critical sense for both information and shades of meaning" (1988, p. 82).

Critical Viewing 3-D Model

Critical viewing of student performance is the next step in the evolution of critical viewing skills. The general framework consists of "the principles of intervention, goal attainment, cultural understanding, and literacy" (Long, 1989, p. 13). Intervention involves understanding the process of perception and may be altered through self-regulatory skills. This is a major step because it is at this level that the viewer stops being a passive viewer and becomes an active viewer. The active viewer begins to understand how his/her own internal perceptions and biases are developed. Individuals bring a set of beliefs to every situation. Discovering how to separate one's own perception from the visual messages in a situation is the key to becoming a critical viewer. An example of this is a teacher using a rubric to assess a child's performance. In order to incorporate critical viewing into the assessment the teacher must use intervention to understand how his/her internal perspectives may affect the assessment. For instance, if a teacher is tired or has had difficulty with a particular child in the past, a skewed perspective of the child's ability may occur. This skewed perspective may in turn alter the assessment process.

The next step in the process of becoming a critical viewer is goal attainment. Goal attainment involves monitoring and understanding one's own reasons for attending to the learning situation as well as recognizing the student's own (and possibly different) rationale for participation. In other words, the viewer and the student performing the learning activity each have a set of goals. These goals do not necessarily refer to learning activity goals but refer to the personal goals of the teacher and of the student at the time of assessment. The teacher may want the student to complete the activity in a certain way and the student may want to just get through the task. It is the responsibility of the critical viewer to understand his/her personal goals as well as the goals of the person being assessed. By accomplishing this, the critical viewer can ensure that the goals of the learning activity are mutually understood and that the evaluation of the students' performance is not adversely affected by a clash of personal goals.

The third step in the critical viewing process is cultural understanding. Cultural understanding is knowing where the learning situation exists within the social schema. It is the opposite of the intervention step because the viewer now focuses on external awareness of others perceptions and biases. The viewer is concerned with understanding the perceptions and biases of individuals being assessed. For example, students' race, religion, gender, etc. play a large role in their perception of any learning situation. The students' perceptions and biases likely affect their performances and thus adversely alter the assessment unless the teacher/viewer incorporates cultural context into the assessment situation.

The final step in the critical viewing process is literacy. Literacy is understanding the overall grammar of the learning situation, such as body language or actions of the learner in the course of an activity (physical, behavioral, and/or cognitive). It is at this step in the process that the viewer can take all the knowledge gained from the first three steps of the critical viewing process and actually interpret what is seen during the learning activity. For example, the body language, vocal tone and verbal usage of a diabetic child with low blood sugar will appear as a normal child behaving poorly. A trained and well-prepared teacher critically viewing the learning situation will assess the whole child within the learning context. A teacher passively viewing the situation might assess the child incorrectly by not being aware of perceptions and biases, personal and other goals, external awareness of others' perceptions and biases, and the literacy of how to communicate.

The four steps to critical viewing skills create skilled observers who are trained and prepared for authentic assessment. Critical viewing adds the missing dimension to the authentic assessment process, filling in valuable contextual information about performance, thus creating a more valid and reliable assessment.

The Third Dimension within the 3-D view of authentic assessment acts as a pre-assessment focusing session geared to heighten a teacher/researcher's concentration in order to help filter irrelevant perceptions or biases that may be present during an assessment situation.

Summary

What is taught, *how* it is taught, and *how* it is assessed are critical issues within the educational community. The 3-D view of authentic assessment integrates the major steps of the development of an authentic assessment instrument.

The First Dimension addresses the need to carefully formulate a clear understanding of *What is to be assessed?* This includes the identification of the purpose of the assessment, recognizing the uniqueness of the learners, and possessing a knowledge base of the subject matter to be instructed.

The Second Dimension looks closely at *How is it to be measured?* Determining appropriate learning outcomes will drive the instructional and assessment processes, therefore the formulation of the learning outcomes and the criteria and standards that will be applied to them are critical components. This leads directly to the final phase of the Second Dimension the selection of a suitable assessment task. Ralph Tyler (1949), father of modern evaluation, commented that without an understanding of what a learner is to know and how it is to be expressed, makes the determination of whether or not learning has taken place a difficult process.

Incorporating the Third Dimension, *interpreting verbal and non-verbal messages or data*, into the observational process of authentic assessment provides an important filtering method. Goodman stated, "teachers are constant kid watchers" (1986, p.41). As such, classroom teachers need to be trained and well-prepared observers of all activities throughout the school day. Teachers must remain focused and objective just as qualitative researchers in various scientific fields involved in examining trends or patterns of meaning and social context in human behavior. Trained and well-prepared classroom teachers therefore become more astute observers of the underlying meaning and social context of student behavior, thus, creating the potential for improved quality of their findings and ultimately their assessment procedures.

The filtering method in the Third Dimension is a key component in accurate interpretation of verbal and non-verbal messages that teacher preparation is essential. This filtering session can be seen as a pre-assessment focusing session. The inclusion of a focusing session prior to an observational assessment takes a short amount of time and has the potential of positively impacting the assessment process. This focusing session sharpens a teacher's concentration and heightens the teacher's awareness of personal interventions, goals, the cultural context, and literacy issues that may interfere with or contaminate the assessment process. Being in an assessment-ready mode to keenly zero in on the observational data to be collected is a critical step in the assessment process.

Critical viewing skills are important components of the authentic assessment process. These skills involve the ability to interpret visual messages accurately while separating them from one's own perceptions and biases. Even before a visual message is recorded by the teacher, the visual image needs to be interpreted. The encoding and decoding process that a teacher goes through while interpreting an educational situation should be free from preconceptions and personal bias while at the same time providing useful and accurate information on student performance. The ability to understand and analyze the persuasiveness of visual messages is an important skill in the process of observation.

The integration of the third dimension into the authentic assessment process provides the classroom teacher with a systematic method of developing an effective assessment instrument. Processing information through the first, second and the third dimension gives a classroom teacher a sense of confidence in their own assessment instrument as well as their observational skills.

As classroom teachers strengthen their observational skills and begin to recognize their roles as *teacher-researchers* involved in important action-research, hidden benefits are likely to be discovered. The impact of these hidden benefits will be seen on two levels. On one level, the classroom teacher will experience an increase in confidence and professionalism. On another level, the benefits will have a direct effect on both daily instructional and social classroom activities. The significance of these powerful hidden benefits will, by their very nature, have a positive impact on a teacher's creativity and overall effectiveness in the instructional and assessment process of student learning.

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Cover Art, Consumerism, And YA Reading Choices

by Cosette Kies

Introduction

Cover art, including both book jackets for hardcover books and covers on paperbacks, have long been used by publishers as a marketing device. In today's affluent society, teenagers have become a major marketing focus for many products, including books.

This paper will consider certain aspects of book cover design. Also, consideration will be given to recent cover designs of specific covers over time to illustrate changes caused by marketing. Some attention will be given to international aspects of one book title.

Cover Art

Books published for young adults (YAs), teenagers aged 12-18, have two primary audiences. Books with hardcovers and dust jackets are aimed at the adults who work with teens, such as teachers and librarians. Paperbacks, however, are produced for the teens themselves. Teenager prefer the paperback format and have become buyers of paperbacks themselves.

In spite of two different audiences for marketing, teenagers are the ultimate consumers. For the most part, YAs are the ones who actually read the books, both in hardcover and paperback formats. With this in mind, publishers have discovered through remarkably unsophisticated "research" that certain guidelines need to be followed in producing books covers. This has resulted in an uncodified set of vague rules, a sort of publishers' conventional wisdom.

One of the most important elements is the need for honesty on the covers. Honesty has been determined to be a rule for YA covers for some time, yet is still not scrupulously followed. If the illustration on the cover of a book implies something else rather than the actual contents of the book, teenagers are disappointed. For example, the most popular genre for teenagers today is horror. This has resulted in many thrillers and mysteries being designed with the current standardized horror cover: dark background, white (or pale) lettering, and something (or someone) to suggest something pretty awful taking place in the book. This can be seen quickly in the recent resign of Lois Duncan's paperbacks. Lois Duncan has been a popular writer of thrillers for adolescents for over twenty years. Like most authors, she is not involved actively in decisions regarding cover art.

Duncan's books have been genre bestsellers for the past couple decades. A few years ago, her books were redesigned, obviously to capitalize on the current teenage taste for blood, gore, and nasty stuff. The books are really not horror titles, but have been packaged to look like them. Oddly enough, this doesn't seem to turn the teenage readers off because of implying that there is more gore in the book than actually exists. So it may mean that the first rule of cover art, honesty, may not be that important at all. One possibility is that many readers of the Duncan titles are happy to be seen reading something that looks pretty shocking, but are secretly happier with milder contents.

Figure 1
TWO PAPERBACK COVERS FOR KILLING MR. GRIFFIN

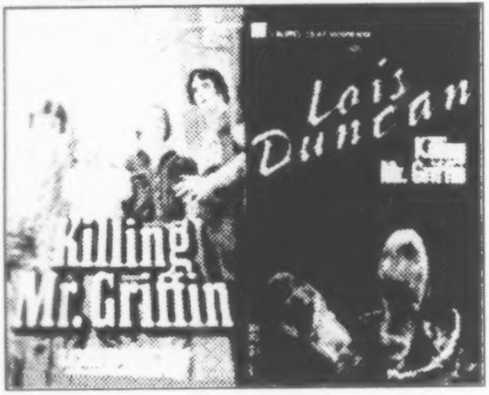


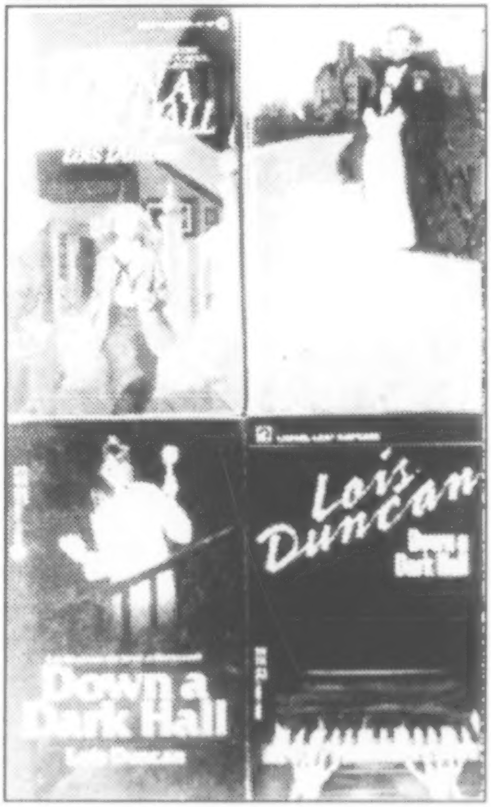
Figure 1 shows what has occurred with one of her more controversial books, Killing Mr. Griffin. It tells about a small group of teenagers who kidnap a despised high school English teacher with the odd idea that they can scare him into giving them better grades. The plan backfires. Mr. Griffin suffers from a heart attack and dies, leaving the perpetrators with a corpse on their hands.

On the left, the original paperback cover (1979) shows the teenagers wearing "in" clothes and hairstyles for that time. They are staring down with horrified faces at an unseen corpse. One, the psychopathic ringleader, smirks. The newer cover (1991) eliminates the teenagers altogether, showing only the tied ankles of the body. The new version is more dramatic and certainly will not become as dated as quickly as the original. Adolescents sometimes admit that they do not want to read books with pictures of dumb-looking kids on the cover.

During the 1970s and 1980s it was felt that it was important to show adolescents on the covers of paperbacks. Personal identification with the characters in the books was thought to be vital for teenagers. Although some covers now avoid using people at all, there is still considerable use of teenagers on covers. In fact, Caroline Cooney, another popular writer of thrillers for teens, has said that her publisher insisted on putting the figure of a girl on the cover of one book even though the central character of the story was a boy. Another bit of conventional wisdom at work; more teenage girls buy books than teenage boys, hence the cover art should include, or feature, a girl. Another belief is that girls like stories with romance, therefore a boy and girl together on a cover is considered another good marketing ploy.

Another example of paperback cover design can be seen in Duncan's 1974 work, Down a Dark Hall, the story of an small, exclusive, all girls' boarding school. It is so small and elite that there are only four, carefully selected students. The faculty, also is small. It becomes obvious very quickly that something is terribly wrong in the school. The heroine, Kit, discovers that the girls are being used as hosts for dead geniuses of the past. Kit herself has been "invaded" by the soul of a brilliant musician. Since Duncan's books are not really horror, right prevails in the end. The evil headmistress is defeated and Kit escapes from the terrible school.

Figure 2
Down a Dark Hall



The book was first published in 1974, providing the opportunity for four different paperback covers for the still popular book. Figure 2 provides a cover history of about 20 years.

The original paperback cover (upper right) is simply a miniature version of the original, and still, hardcover dust jacket. It is typical of many gothic covers. Gothic novels were very popular in the 1970's, and the publisher was obviously trying to cash in on that then-bestselling genre. The figure of Kit, naturally dressed in the mandatory gothic white nightgown, looks up in fear. The musical genius who has invaded her body looms over her. He looks a lot like Franz Schubert. The obligatory dark, brooding gothic building of the school is in the background.

A few years later (upper left), another paperback cover appeared. This time, Kit (whose hair is shown as flaming red rather than brunette) is dressed in a school uniform and flees down the hallway of an old Victorian mansion. The cover is no longer in the most ridiculed gothic cover style, but still retains the visual elements identifying this book as a thriller for girls. The illustration actually reinforces the title of the book quite nicely.

The third paperback cover for Down a Dark Hall (lower left) goes back to Kit with dark hair and dressed in a white night robe. This time she stands on a staircase holding a lighted candle. She is staring at the darkness beyond, looking apprehensive.

The current paperback cover (lower right) is another redesign now pitching the book as horror, rather than a thriller, or gothic. Here we see skeleton

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hands playing a piano keyboard, symbolic of the dead genius whose spirit has invaded Kit's body.

Marketing and Consumerism

The changes in the cover art for Down a Dark Hall illustrate clearly the thinking of publishers in trying to appeal to the popular market of the moment. These particular covers also show certain characteristics of cover art thought to entice potential buyers. Another bit of publishers' conventional wisdom is that if a potential purchaser actually picks up a book, there is a good chance that book will be bought.

Publishers appear to have done little or no scientific research regarding cover art. Even though covers are assumed to have a great influence on potential buyers, publishers seem to rely more on impressions than actual marketing research.

A few studies have been conducted on book choice based on covers in the academic world. Younger children are influenced most by cover art when selecting books. (Examples: Kirk, 1985; Rankin, 1944; Smith, 1994; Vacek, 1982) One study done by Margaret Marshall in Great Britain (1982) discovered that teens are less likely to be influenced by cover art than the books' titles, but covers were the second most important factor in selection.

In the publishing world, editors seemingly consult casually with first-level buyers, such as booksellers, librarians and teachers. Little appears to have been done using teenagers themselves as members of focus groups and taste panels. In spite of the high cost of providing first rate cover art, particularly paperback art, text and art editors in the publishing houses rely on the aforementioned conventional wisdom and instinct. They are also influenced by successful cover art used on book covers done by other publishers, but it is overall a very imprecise process.

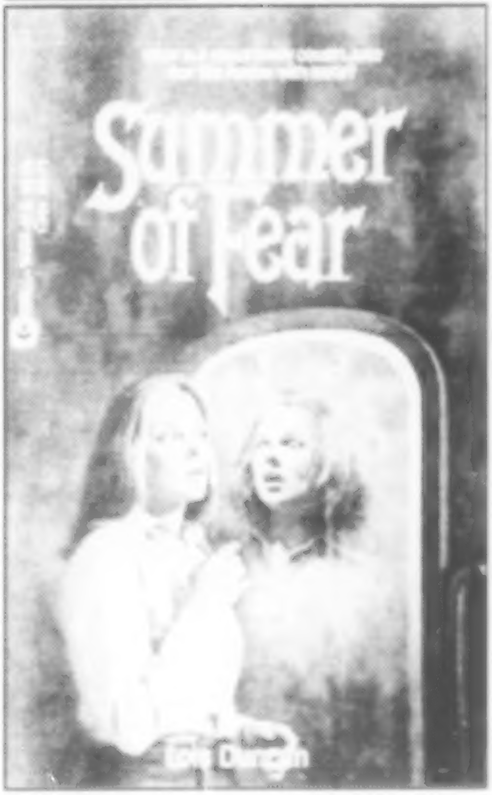
There is even disagreement over the use of movie tie-in covers. Some publishers believe that a cover related to a recent movie release will automatically increase sales. Those involved in publishing classics, however, have concerns about maintaining a classy image for the book, as well as not dating a cover with an image from a particular movie.

Although much "borrowing" goes on in publishing regarding cover art, publishers do protect their rights on occasion. A recent example was the legal halt of an imitation cover of the wildly popular V.C. Andrews' books.

International Interpretations

There is some interest in using book cover art in more than one country as an obvious way to cut costs in book production. However, at this time, most covers are redesigned in the international market. An examination of a Duncan title provides an illustration. The original hardcover dust jacket (1976) features a dark-haired teenager in a bikini with a witch's face super-imposed over the girl's face. Figure 3 shows the original American paperback cover (1977) of Summer of Fear.

Figure 3
Summer of Fear



The story focuses on Rachel, a 15-year-old teenager in the Southwest. After her aunt and uncle are killed in a car accident in the Ozarks, Rachel's cousin Julia, aged 17, comes to live in the Southwest with Rachel's family. Rachel becomes increasingly suspicious of Julia, and finally discovers that the girl is an imposter and a practioner of black witchcraft. Julia plans to kill Rachel and her family, then marry Rachel's father. In the end, Rachel manages to save her mother. Julia, now exposed, disappears, probably to try her sneaky plots elsewhere.

Duncan's books are popular in many countries. Descriptions of the cover arts in some European countries of Summer of Fear follow.

- England: an unpleasant redheaded girl of about 14 glowers at another teenage brunette girl who scowls back. The background depicts Southwestern mountains.
- France: a black haired woman in a flowing white evening gown sits in a romantic setting holding a candle.
- Germany: a girl about 12 gazes in horror at a tiny Halloween pumpkin in a nest.

It should be noted that the current paperback American cover has been redesigned as a simple horror genre title with the artwork showing the photo of a skull lying in a photographer's developing tray.

As Duncan observed in a letter to me in September, 1995, "All I can say about the jackets of foreign editions is that each book is a new adventure. Many times when I received my author's copy I have no idea which book it is. I can't read the text, and the jacket has no resemblance to anything I've ever written. I go leafing through to see if the name of a character might pop up to give me a clue, but that doesn't work with editions in Oriental languages."

It can only be assumed that the publishers in Europe and elsewhere have a sound idea of what their market groups want, if it is only the conventional wisdom to be found in the U.S. Whether or not they have engaged in more focused research than American publishers can only be conjectured.

Summary

In spite of the apparent importance

of cover art in selling books to both adults and young adults, American publishers have done little structured analysis to determine what factors are important in making sales. It may be that these unknown factors change too quickly to make such analysis, if not useless, frustrating. It can only be concluded at this point that book cover art is based on instinctual rather than proven factors.

Another aspect contributing to the imprecise process of book cover art is the secretive nature of many teenagers. Adolescence is a hard time for most kids, and they are often unwilling to share their thinking and reactions about a lot of things, including book cover art.

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The Effects of Computer Visual Appeal on Learners' Motivation

Adel Sultan
Marshall Jones

Introduction

Many years ago, learning was situated (Viau, 1994). A farmer, for example, would take his son to the field and teach him practically how to plant the seeds, weed the plants, and collect the crops. The son, in this learning situation, would have the opportunity to observe and model after his father, practice what he observed and learned, and get immediate feedback to correct his performance.

Eventually, schools and mass teaching started to emerge, especially after the invention of paper (Viau, 1994). Learning, consequently, shifted from the situated to the theoretical (prose information), and learners then did not have to go to the field in order to learn the acquired skills.

But, even though schools successfully produced professors, scholars, army lieutenants, and highly accomplished businessmen, they had, and will still have, their own inherent flaws (Toffler, 1974). To further explain, a typical school environment;

- does not adequately address the individual differences between learners,
- does not seriously consider the various learning styles of the learners,
- encourages competition rather than cooperation between learners,
- is ability- rather than achievement-oriented,
- uses the "carrot and stick" strategy to motivate learners rather than create intrinsically motivated learners, and
- delivers instruction mainly through one approach: teacher-led instruction.

As a result, many students, especially low-ability students, had lost self-confidence, lost motivation, lost interest, built negative attitudes toward learning, and/or dropped out of school (Toffler, 1974). The failure of these students concerned many educators as well as parents and pushed them to think of a way to improve the performance of the educational system.

Implementing technology in education was one of the steps taken to improve the educational system. During World War II, the military utilized the overhead projector, a technology which was designed to deliver mass instruction to a large number of troops (Saettler, 1990). The overhead projector, along with other technologies, such as the slide projector, opaque projector, film strip, and video, were eventually adopted in schools, since schools also deliver mass instruction. The most important features of these technologies is that they help deliver the instructional message in different forms: visual, audio, color, and animation. These features have helped teachers accommodate the differences in the learning styles of learners, and made learning more enjoyable (Heinich, Molenda & Russell, 1993).

Utilizing Computers in Instruction

The computer, as a relatively new technology in schools, has proved to be an effective teaching and learning tool, and it is also capable of delivering instruction in the forms of visual, audio, color, and animation (Lockard, 1987). Multimedia-based computers are capable of providing the functions and features of all the technologies mentioned above (slide projector, opaque projector, filmstrip, and video).

To list its technical capabilities, the multimedia-based computer nowadays can

- interact with a laser disc player to display analogue movies,
- interact with a VCR to display the content of a videotape
- run a photo CD as well as a CD-ROM, which can store a large amount of text, graphics, photographs, audio, and video,
- display audio through high-end stereo speakers,
- allow its user to communicate verbally with and physically watch another computer user located somewhere in the world through modems and networking software, and
- display digital movies, which can be imported from a videotape, a CD-ROM, or a television set.

The primary function of the multimedia-based computer is to deliver instruction which accommodates a diversity of learning styles (Heinich, Molenda & Russell, 1993). A learner receiving instruction via multimedia is exposed to a variety of textual, graphical, audio, video, photographic, or animated information. In contrast, a learner receiving traditional instruction is less likely to be exposed to such an informational diversity.

Computers and Learner Motivation

Variation in the instructional approach has proved to heighten the motivational level of learners. Yang (1992) reports that learners exposed to computer-based instruction demonstrated high levels of motivation and positive attitudes toward learning. But, what is meant by motivation? What motivates a learner? And how does a motivated learner differ from a nonmotivated one?

Motivation, according to Schunk (1991), "is the process whereby people set goals and engage in cognitive activities (e.g., monitor goal progress) and behaviors (e.g., expend efforts) to attain their goals." Motivation cannot be directly observed; however, it can be inferred from people's statements, choice of action, effort expenditure, and task persistence.

Schunk postulates that learners are either intrinsically or extrinsically motivated. Intrinsically motivated learners exert effort simply for the inherent pleasure of the learning task itself. Thus, the learning task is selected and participated in merely for the pleasure it generates and is perceived as the desired end. On the other hand, extrinsically motivated learners view the learning task as a means to obtain a reward or to avoid punishment. Therefore, the completion of the task serves as the means to earn the desired extrinsic reward or avoid the punishment.

The difference between motivated and nonmotivated learners is that motivated learners, whether they were intrinsically or extrinsically motivated, are more likely to;

- exert greater effort on the task,

- choose to work on the task voluntarily,
- spend more time engaging with the task,
- learn faster,
- have high outcome expectations, and
- persist longer in the face of task difficulties.

However, research studies (Newby & Alter, 1989) indicate that intrinsically motivated learners remain engaged longer in the task and demonstrate a stronger persistence in the face of task difficulties with no thought of external rewards, since they reward themselves. In what follows, a number of studies will be reviewed to illustrate how computers have effectively helped motivate learners intrinsically.

In one study, Rieber (1991) examined the effects of computer animated presentations on intentional and incidental learning and how these presentations contained intrinsically motivating features, as measured by continuing motivation. One of the study's objectives was to investigate whether computer animations hold intrinsically motivating features for learners. Learners choosing to return to engage in the learning task in a free-choice situation was used as a measure of their motivation and continuing motivation.

The 70 fourth-grade subjects in this study were taught a lesson on Newton's laws of motion. Subjects were exposed to two kinds of visual presentations: static graphics and animated graphics. Both kinds of visual presentations elaborated the textual information of the lesson.

Results showed that subjects overwhelmingly chose to return to engage with the computer animated graphics when placed in a free-choice situation. These results support one of the study's hypotheses that the computer animated visuals hold intrinsically motivating appeal for learners. Rieber pointed out that this appeal led learners to maintain interest and choose to stay on the task for longer periods of time and in meaningful ways.

In another study, Fredrickson (1990) described the instructional, motivational, and communicational roles of audiographics–a system comprising of computer graphics, telephone communications systems, and teaching strategies. In this study, Fredrickson reported the positive effects of audiographics on the motivational levels, attitude levels, and quality of learning of both high school and college students.

According to Fredrickson, a teacher, through audiographics, can create instructional visual images and send them to computers at remote sites to be stored. That teacher can connect with others (students or other teachers) at the remote sites whenever needed through telephone lines, an audio-bridge, and modems. This connection capability enables teachers and students to interact with each other as they do in a traditional classroom. The teacher-student video interaction is carried out through the computers, while the audio message is transmitted through the speakerphones. For illustration purposes, a teacher can display a visual image on all of the monitors (at different sites) at once. Students at the other sites can manipulate (draw or write on) the displayed image in response to a question or to demonstrate knowledge.

Describing the positive effects of audiographics, Fredrickson reported that learners' motivational, as well as attitudinal levels, improved significantly. Fredrickson explained that learners enrolled in an audiographics course did not wish to be seen unprepared for class. They knew that through the teacher-student (or even student-student) video interaction, it was very noticeable when one had not prepared well for class, which caused them to be extrinsically motivated to be prepared. Fredrickson also added that, by having information presented visually on the monitor and discussed verbally, different learning styles were be being fulfilled. As a result of this technical, instructional capability, learners became more intrinsically motivated toward their learning. For Fredrickson, audiographics is the most effective, efficient, and motivation enhancing computer-based distance education system currently available.

Another study was conducted to investigate the effects of humorous computer visuals on learning and learners' attitudes. In this study, Snetsinger and Grabowski (1994) hypothesized that incorporating a humorous theme and cartoons associated with humorous comments to support the content helps motivate learners to attend to and retain computer-based instructional materials better than materials presented in a standard, nonhumorous way.

Subjects were college students divided into three groups. One group of 43 students received a computer-based lesson, entitled "Anatomy of the Hard Tick". This lesson included a humorous theme and cartoons, and humorous comments related to the content. Humor in this study used a theme that was ridiculous, exaggerated, and informal, and included occasional mnemonics. A second group of 32 students received the same lesson without the inclusion of humor. A third group of 40 students served as a control group.

Results indicated that there were no significant differences in learning and retention between the two treatment groups. The authors of this study interpreted this as meaning that the scientific, sequential use of computer graphics was meaningful enough to produce positive effects even without the use of humor. However, the results did indicate that with the group receiving the humorous treatment, there were outer expressions of amusement, such as smiles and laughs. Results also indicated that humor did have an affective impact in that the humor group was more worried by the dangers of ticks and tick-borne diseases. The authors theorized that this was the result of the dramatic reinforcement of the content.

Motivation-Enhancing Guidelines

Based on the literature (Keller, 1983, 1988, 1993; Rieber, 1994; Malone, 1981) regarding computer visual appeal, several guidelines should be considered for the design of computer-appealing features (CAF's) that enhance motivation:

- Provide CAF's that adequately support the needs of learners, content, and the nature of the learning task.
- Provide CAF's that increase learners' motivation and interest rather than distract them.
- Change the presentation and frequency of CAF's to stimulate learners' attention and curiosity.
- Provide CAF's that provoke mental conflict to stimulate epistemic curiosity.
- Provide CAF's that include the elements of novelty, surprise, and drama to pique learners' curiosity.
- Provide CAF's that trigger learners' fantasy and imaginations.
- Provide CAF's that stimulate an attitude of inquiry.
- Place CAF's strategically throughout the content.
- Use CAF's to direct learners' attention to the key points within the content.

- Relate CAF's to learners' existing knowledge and skills.
- Use CAF's as analogies to connect the content to concepts and skills already familiar to learners.
- Provide CAF's that can be related to meaningful goals in learners' future.
- Include a challenge element in the design of CAF's to produce an appropriate expectancy for success.
- Provide CAF's that increase learners' confidence by giving them adequate guidance.
- Include learner options in the design of CAF's to promote an internal sense of control on the part of learners.
- Provide CAF's that resemble the real world application of the content to produce a perception of natural consequences.
- Use CAF's to provide feedback regarding learners' performance.
- Include CAF's that make the content easier to interpret and use in order to maintain attention and build confidence.
- Provide CAF's that include people to gain and maintain learners' attention.

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Considerations For Designing Instructional Virtual Environments

Vanessa Paz Dennen
Robert C. Branch

Imagine floating among the planets, touching each of Saturn's rings as you count them, or pushing two molecules together in order to see their chemical reaction. Perhaps you could visit an archaeological dig in Egypt for the afternoon or drop in on a French village to practice your language skills. The scenes described above exemplify educational virtual reality (VR) experiences that could be created through the collaboration of instructional designers, computer scientists and media experts.

Virtual reality is an immersive, interactive medium that relies on computer-mediated manipulations of the visual, aural and tactile senses to provide users with simulated experiences in computer generated worlds. These virtual worlds may reflect either potentially real or fantasy settings.

The visual design of virtual reality, an image-oriented medium, is an important issue. Virtual reality literature reflects both the instructional potential of the medium and the need for guidance in designing the visual interface. There is no current protocol for designing instructional virtual environments (IVE's). Nilan (1992) states that the current orientation of VR research and development toward the technology's ability to simulate accurately a physical environment suggests that VR is a solution looking for a problem. Steuer (1992) believes that existing VR research has neglected to provide an understanding of many aspects of the technology, including effects, design considerations, and aesthetics. To use VR successfully for achieving instructional goals there are still many aspects of the medium that we must explore.

Virtual reality's status as a new medium means that few people can claim to be experts in its specialized applications. Helsel (1992) sums up the current situation: "To date, the agenda for VR has been set by the computer science community. . . . Yet, education has a tremendous wealth of information and experience to bring to the VR curriculum" (p. 42). Thus we need the collaboration of those experts who are knowledgeable in specialized aspects of the medium to set the research and development agenda of instructional virtual environments.

A study of technology designers, media experts and instructional designers was conducted to share ideas and generate data regarding how the visual interface of IVE's should be designed to maximize the success of this educational medium. Participants were asked to comment on: (a) what constitutes an IVE; (b) when IVE's should be used; (c) design principles for constructing IVE's; (d) who should be involved in the IVE design process; and (e) how IVE's should be evaluated.

Methodology

Problem Statement

Virtual reality as an educational medium is a means to an end. It can be seen through an input-process-output paradigm in which the initial input is data from the human user, the process determines and presents appropriate instructional content mediated by a computer engine, and the output is increased human knowledge. The current technological focus of VR has resulted in the notion that it is a solution in search of a problem rather than a tool in the instructional technologist's toolbox. Roblyer (1993) finds this approach problematic: "Without a clear vision, we have no hope of getting to where we want to go, and the lack of vision, as the prophets warn us, could prove fatal" (p. 34). Thus, a blueprint or conceptual framework consistent with the theories and practice of instructional design is needed to guide the future of virtual reality.

Research Questions

The general question for this study was, "What principles should be considered when designing instructional virtual environments (IVE's)?" The specific research questions for this study were:

1. How do you define virtual reality?
2. How should virtual environments be designed to facilitate learning?
3. Who should be involved in the design of virtual reality, and what form should their involvement take?
4. How should educational virtual reality experiences be evaluated?

These questions were asked of participants in a modified Delphi study. The Delphi technique is a research method involving multiple surveys of a population. It is based on the adage "Two heads are better than one" (Dalkey, 1972, p. 15), with the objective of reaching group consensus on survey items.

The questions became more defined and new issues were raised during the Delphi process, which requested that respondents make statements related to the research questions in the first round and then reflects those responses in subsequent survey instruments. The questions given here, then, served as an initial guide for the Delphi participants.

Participants

Participants in this study represented three fields of research, instructional design, computer science and media. Instructional designers were chosen for their experience in designing instructional content. Computer scientists and media experts were chosen for their intimate knowledge how technology works and media design, respectively. Specific selection criteria required that participants be knowledgeable in one of these three fields as evidenced by their job positions, research, and educational backgrounds. Additional qualifications for all participants were access to and ability to use electronic mail through the Internet.

Data Collection Procedures

This study involved three rounds of Delphi surveys. The first round generated predictions and statements pertaining to the four broad research questions. The second round generated participant ratings of their agreement with these statements. The third round attempted to reach group consensus on the ratings of these statements.

Description of Conditions

All participant communication was conducted solely through electronic mail. Contact was made by the researcher only, and was limited to the initial request for participation and messages pertaining to and including three rounds of surveys.

Instruments

The Round One survey consisted of the four broad research questions developed from information generated by a literature review. Its intent was to elicit responses for use as survey items in succeeding data collection instruments.

The Round Two and Round Three surveys consisted of 97 items divided into five major sections:

I. Defining Virtual Reality (10 items)
II. Using Virtual Reality In Education (14 items)
III. How to Design Instructional Virtual Environments (19 items)
IV. Who Should Design Instructional Virtual Environments (32 items)
V. Evaluating Instructional Virtual Environments (22 items)

All of the Round Two and Three items were derived from responses to the Round One survey. Samples of Round Two and Three items from each of these survey parts are in Table 1.

Survey Part	Sample Item
I	An element of VR is the interaction of human senses and computer peripherals
	An element of VR is a computer simulations in which the user controls point of view
II	VR should be used in education to teach spatial information
	VR should be used in education only when cost effective
III	IVE's should be systematically designed
	IVE's should be fully immersive
IV	IVE's should be designed by a team
	Instructional designers should be involved in the design of IVE's
V	IVE's should be evaluated to determine evidence of learning
	IVE's should be evaluated using user observation

Table 1: Sample survey items

Participants were asked to rate each item on a given Likert scale. Part I, Defining Virtual Reality, contained definitions or parts of definitions and requested that participants indicate how these statements compare to their personal concepts of virtual reality, ranging from "1" (Much broader) to "5" (Much narrower). Parts II - V asked participants to classify their feelings about statements according to the following scale, originally used by Holden and Wedman (1994):

1 - Strongly disagree
2 - Disagree
3 - Disagree with reservation
4 - Agree with reservation
5 - Agree
6 - Strongly agree

Respondents also were encouraged to add any comments they felt necessary to their responses.

Data Analysis

Data generated by the final survey round were numerical ratings from Likert scales. The mean, median and quartile deviation again were calculated to determine definition of "virtual reality" (Part I only), importance of concept (Parts II - V only), and level of consensus for each survey item.

The Part I responses rated elements of possible definitions of virtual reality. The median responses were used to determine whether or not the study group and field sub-groups felt a particular phrase broadly (median $\geq$ 2.5), closely (median $<$ 2.5 and $>$ 3.5) or narrowly (median $\geq$ 3.5) applies to virtual reality.

Parts II - V asked participants to provide their level of agreements with certain phrases. Those items with which the study population either agreed or disagreed strongly (median $>$ 2 or $<$ 5) were considered extremely important to the design of instructional virtual environments. Items rated with solid agreement or disagreement (medians $\leq$ 2 and $>$ 3 or $<$ 4 and $\geq$ 5) were considered important. When reservations were expressed on either agreement or disagreement with a statement (median $\leq$ 3 and $\geq$ 4), that item was considered to be of negligible or uncertain importance to instructional virtual environments.

Level of consensus was determined in accordance with the Delphi studies of Faherty (1979) and Holden and Wedman (1994). Using quartile deviation as the indicator, items were divided into those achieving high, moderate and low consensus. A statement was said to have achieved high consensus when the quartile deviation was ≤ .50 for Part I and ≤ .60 for Parts II - V or, in other words, when the deviation of responses in the interquartile range was less than one point on the Likert scale. Moderate consensus was indicated by quartile deviations > .50 and ≤ 1.00 for Part I and > .60 and ≤ 1.00 for Parts II - V. When quartile deviation exceeded 1.00 in any survey part, the item was classified as low consensus.

Results and Conclusions

The 97 items surveyed in five categories yielded 65% items attaining a high level of consensus and 31% with a moderate level of consensus. From these items, a total of 14 conclusions were made.

Virtual Reality Definitions (Part I)

It was important to have survey participants consider their own definitions of virtual reality for two reasons. First, it made each participant carefully consider properties and elements of the medium they were about to comment on in the rest of the study. Second, it provided a basis for understanding respondent ratings and comments on other survey items.

There were ten items in this section, of which five achieved high consensus, three achieved moderate consensus and two did not reach consensus. For most items the median ratings for all sub-groups fell within the range of one point. The study population did not find any of the given definitions too narrow, although definitions specifying only imaginary worlds and synthetic experiences were considered too broad.

The participants' definitions of virtual reality centered around computer simulations and human-computer interfaces. The following elements were considered additional parts of an appropriate definition: (a) involves the user in a realistic 3-D world, (b) exists on a continuum from marginal (computer desktop) to a full-immersion alternate reality system, (c) user controls point of view, (d) user feels presence, and (e) user interaction is required in the form of direct object manipulation.

Two conclusions were drawn from the definition section of the survey:

1. Virtual reality is defined by the computer-mediated experiences that it provides for users.

2. Virtual reality, while interactive, does not require full immersion.

This first conclusion is significant because the term "virtual reality" often is used in reference to a certain hardware-software configuration (Heim, 1993). In this study, not one of the participants used specific equipment to describe the medium. Instead, their definitions were in agreement with Ferrington and Loge (1992) and Pimentel and Teixeira (1993), who refer to VR as a computer-mediated experience. While respondents included different elements in their definitions, such as 3-D worlds and direct object manipulation, all agreed upon the basic necessity of an experience provided by a human computer interface. The study population's strong agreement on this issue suggests that as the technology develops the definition of the medium is becoming more conceptual and less equipment-dependent.

The second conclusion addresses a key variable of virtual environments. Immersion exists on a continuum (Pimentel & Teixeira, 1993) and it is unclear from the literature exactly when the level of immersion is deep enough for the computer-mediated experience to cross over from simulation to virtual reality. While participants did not overtly address the location of this crossover point, they did agree that (a) immersion exists on a continuum from marginal to full, (b) mere computer simulation or computer-mediated communication is not immersive enough to be considered virtual reality, and (c) full immersion and full sensorial stimulation are not essential to instructional virtual environments.

As a variable, immersion should be determined by need; not all IVE's will require the highest level to reach maximum efficacy. For example, an IVE designed to teach molecular docking would rely heavily on visual stimuli, but little on aural factors. Cost of production and use increases alongside level of immersion, and participants suggested that virtual reality should be used when cost effective. Inclusion of extensive aural stimuli in this example scenario might cost a significant amount without greatly increasing the efficacy of the environment. For these reasons IVE's should be evaluated carefully during the design phase to determine the immersion level that is appropriate to the content and context of the instruction.

When to Use VR for Instruction
(Part II)

This part of the survey contained 14 items with the consensus being high for eight items, moderate for five items and low for one item. For most items the median ratings for all sub-groups fell within the range of one point.

Overall, participants felt that VR is not a learning tool to be used in all situations; more specifically, they indicated that IVE's should be used for more than just gaining user attention and should be cost effective. This data resulted in the following conclusion:

3. Virtual reality is an appropriate medium for some educational situations. This statement supports the writings and research of instructional designers and computer and media technologists, such as Ferrington and Loge (1992), Fritz (1991), Helsel (1992), and McCluskey (1991). They propose VR as a useful instructional medium because of its immersive qualities and interactive nature; participants highlighted the same features in their ratings and comments, noting also that there are some situations in which VR might not be the best instructional medium. Lanier (1992) similarly finds in an interview with Frank Biocca about VR's future that there are some things students should be learning in the physical world rather than in instructional virtual environments.

Based on the conclusion that virtual reality is an appropriate instructional medium for some educational situations, other conclusions can be made. The data collected support the following statements about when VR should be used in education:

4. Virtual reality should be used in educational situations requiring experience in particular settings. This conclusion was based upon strong participant ratings for usage in the following situations: (a) when dangerous real-life scenarios are involved, (b) when a setting that would otherwise be inaccessible is involved, and (c) when detailed demonstrations or illustrations are needed. This finding supports Bricken (1990), who states that experience is the basis of the virtual reality learning process. Ferrington and Loge (1990) suggest VR as an excellent medium for learning about hostile environments and dangerous materials; Fritz (1991) similarly recommends it for medical and flight instruction. Helsel (1992) mentions using VR to visit a historical era. These examples all indicate that the technology's potential for experience-based learning is high.

5. Virtual reality should be used for presenting spatial or abstract information. Participants rated both of these often-related areas highly. Virtual environments can remove the abstract nature of a topic and increase spatial understanding through sensorial stimuli. Abstract concepts are more easily learned when presented in a visual form (Krueger, 1991). Helsel (1992) and Regian, Shebilske and Monk (1992) support the use of imagery for learning because of the brain's superior visual capabilities. Fritz (1991) discusses spatial opportunities, such as a dance training program in which the dancer is rewarded with pleasant music for correct moves and discordant sounds for incorrect ones. In all of these cases, the belief in sensorial feedback rather than just verbal presentation is strong.

Design Philosophy and Features
(Part III)

This section contained 19 items, 17 of which attained high consensus levels; the remaining two attained moderate consensus. Most items were rated important and the median responses for different sub-groups fell within a one-point range except where noted in this section.

Design Philosophy

Participants felt that a systematic, iterative design process, with objective's established from the beginning, was important. Responses further indicated that the IVE should provide learning in the context in which it is to be recalled. Isolating the concepts to be learned was considered appropriate when important contextual elements are retained. Respondents did not feel that IVE's should be designed necessarily according to the same principles as other media. Comments on this item noted that it may be too soon to tell whether or not such principles are relevant to IVE's and that we should not view VR as merely "an extension of the old technology."

Support for constructivist learning was rated important overall, but the sub-groups of the study, all of which attained high consensus, placed significantly varying levels of importance on this item. Instructional designers felt most strongly, with a median response of six; computer technologists felt most uncertain, with a median response of four.

Participant ratings on how the design process should be approached resulted in two conclusions:

6. *Instructional virtual environments should be created according to the principles of instructional design.* Systematic design, iteration and educational objectives were all considered important parts of the design process. Gagné, Briggs and Wager (1992) state that effective learning must be planned, with goals determined at the beginning. The iterative nature of instructional design is exemplified by Dick and Carey's (1990) model, which provides a continuous option to evaluate and then return to a previous design stage for revision. These principles are supported in the literature of virtual reality by Ferrington and Loge (1992) and Henderson (1991), who feel that motivated, well-constructed virtual environments will provide the most useful learning tools.

7. *The design of instructional virtual environments should consider constructivist learning principles.* Participants were in support of environments that facilitate individual construction of meaning from presented stimuli. This item, along with respondents' suggested experience-based nature of virtual learning, shows the need to explore constructivism when designing instructional virtual worlds. Virtual reality researchers Bricken (1990) and Winn (1993) heavily support this claim. Lebow (1994) states that constructivist values can be used to guide the instructional design process, suggesting that the synergy of instructional design principles (Conclusion 6) and constructivism (Conclusion 7) will provide effective virtual learning experiences.

Design Features

A virtual environment that allows users to see and correct their errors was considered very important. Other elements rated highly included (a) user-friendliness, (b) a high level of required user interaction, (c) built-in tools for interaction and exploration, (d) a way for teachers to enter and interact within the IVE, and (e) allowance for user experimentation and expression.

Providing users with the ability to change environment and object parameters fell at the bottom end of important design features. Comments indicated that this low rating was related not to the item's value as a design factor but rather conditions of its use. Participants felt that environment and object parameter changes should be permitted carefully, judiciously, and only when relevant to the learning experience.

Full immersion and full-sensorial stimulation were not considered essential to instructional virtual realities. In both cases, computer technologists were the sub-group most against mandating these elements. Participant remarks stated that they are variables which need to be addressed on a case-by-case basis, depending heavily on the instructional goal of the learning situation.

From these results, the following conclusions about design features have been made:

8. *Instructional virtual environments should require a high level of user interaction.*

This conclusion was based on participant indications that: (a) much interaction is desirable, (b) tools for interaction and exploration should be included in the virtual environment, (c) teachers should be able to communicate with students in the virtual environments, and (d) user experimentation should be encouraged within the virtual environment. Additional comments indicate that an IVE with a low level of interaction would not be taking full advantage of the medium. Interaction is cited by many researchers (Aukstakalnis & Blatner, 1992; Ferrington & Loge, 1992; Steuer, 1992) as an important part of virtual environments, with particular issues including navigation and user control (Pimentel & Teixeira, 1993). As a medium recommended for experience-based learning (Conclusion 4), virtual reality should not only permit but require users to maintain an active position.

9. Instructional virtual environments should support mastery learning. A potential feature of IVE's that was rated highly is a user feedback system that shows error and allows the user to keep trying until the correct response or performance is attained. Also considered important was the ability of a virtual environment to adjust to user needs through user- and task-centered analysis. These items support mastery learning, as defined by Gagné et al. (1992), by allowing users the opportunity to learn from their mistakes until they accomplish the performance objective within an environment constructed to provide extra time, determine missing prerequisite skills and alter the example or approach to the material as needed.

Virtual Environment Designers (Part IV)

This survey section, which asked what types of people should be involved in the design of IVE's and what their roles should entail, contained 32 items. Seventeen items attained high consensus levels, 14 were moderate, and one remained at a low consensus level. The responses of each sub-group were closely clustered around the overall median, except as noted within this section.

Team-based design, with members representing a broad spectrum of disciplines and having primarily educational aims, was considered important. Participants agreed that those who choose to get involved in IVE design should not let themselves be limited by the technology. Instructional designers, subject matter experts and end-users were considered the most important members of a design team, followed by computer experts, ergonomic specialists and artists. The potential contributions of psychologists, investors and computer hackers were viewed as less necessary to the design process.

Participant indications that many skills and different types of input are required when designing IVE's led to the following conclusions:

10. Instructional virtual environments should be designed by multi-disciplinary teams.

11. Core members of an IVE design team should be instructional designers, subject matter experts and end-users. AND

12. Computer experts, ergonomic specialists and artists may have useful contributions to make to IVE design teams.

Helsel (1992) states that both educators and computer technologists have much to bring to VR design. It is common instructional design practice as well to include subject matter experts (SME's) and users at some point in the process (Dick & Carey, 1990). Pett and Grabinger (1991) suggest the addition of an instructional producer, or someone who has the production skills to execute the design. Shrock (1991) cites a designer-SME-producer triad as the core of a design team.

All of these people have skills necessary to the design of instructional virtual environments. A core of designer-SME-users can examine closely the instructional content and context and evaluate its effectiveness. While Pett and Grabinger (1991) and Shrock (1991) both recommend having a team member with production skills, participants did not find such a person, in this case a computer expert, to be a necessary a member of the design team. Their comments, however, indicate that it may be a partially semantic issue. Many respondents noted that a computer expert would be necessary for execution of the project but should not assume primary responsibility for the initial conception or decisions on how learning should occur.

Evaluating IVE's (Part V)

This section of the study addressed two main issues: (a) what aspects of IVE's should be evaluated, and (b) with what methods they should be evaluated. Sixteen of the twenty-two survey items attained high consensus, with the remaining six reaching moderate levels. Overall results indicated that IVE's should be evaluated for many purposes and through many means. Median responses for all sub-groups were close to the study population medians, with instructional designers consistently rating items slightly higher than the median.

Twelve aspects of IVE's were recommended for evaluation in the Round One survey. All were considered important evaluation foci by the participants, with the highest ratings being placed on studying an IVE's ability to facilitate learning and evidence of learning when an IVE is used.

The Round One survey resulted in ten suggestions for how IVE's should be evaluated. The only items not rated important were traditional evaluation methods and written exams. Participants stated that traditional methods may not be appropriate since they were designed for other media and therefore may not accurately measure the learning that takes place in an instructional virtual environment. Written exams were considered necessary for now, due to their prevalence in our society, but some participants felt there were better evaluation techniques that could be used.

The remaining eight evaluation methods were rated important, but many participants indicated that their response in favor of any one system did not mean that it should be the only one used. Those who commented on how IVE's should be evaluated expressed a belief that many methods should be used as each would produce different information.

Conclusions were made about two aspects of IVE evaluation:

13. It is important to evaluate all facets of instructional virtual environments. Participants recommended looking at all aspects of IVE's to determine their success. These aspects include user performance, user perception of IVE, and cost effectiveness. This finding is in agreement with many virtual reality scholars. For example, Auld and Pantelidis (1994) suggest evaluating cost, feasibility in a school setting and educational value. Scriven (1991) embraces the notion that evaluations can be conducted in a multitude of ways for a multitude of purposes. Particularly in light of this technology's youth, it follows that extensive evaluation of every aspect and application is in order.

14. Instructional virtual environments should be studied using many evaluation methods. As a natural progression from the many potential evaluation purposes (Conclusion 13), participants indicated the importance of numerous evaluation methods. While responses tended to eschew traditional methods such as written tests in favor of observation and interaction-based evaluations, comments indicated that any method is better than none at all and that each method will have its own merits due to the different types of information it will generate. This finding has support in evaluation scholarship (Scriven, 1991) as well as in instructional design (Gagné et al., 1992). Ferrington and Loge (1992) suggest evaluation of student learning in a virtual environment through observations, interviews, personal reflection or user data generated by the environment. Virtual environments to date have been evaluated through such methods as user performance (Regian et. al, 1992), observation (Pimentel & Blau, 1994), and survey (Osberg, 1992).

Recommendations for Future Research

As is often the case with research, for each conclusion that was made many new research paths were uncovered. There are several recommendations that can be made for the directions of future studies.

This study began with very broad research questions and, through the Delphi process, narrowed large issues into somewhat smaller ones. However, there is still a great deal of room for each survey item to be explored in depth. Much of what needs to be done is collaborative in nature; ideas need to be shared and built upon, until a well-functioning systems evolves.

The following are suggestions for types of future studies:

1. A collection of qualitative data, through interviews or long answer survey instruments, from field experts on small, specific topics within IVE design. Topics that could be explored in this way include the roles and tasks of specific design team members, how interfaces for teacher-student interactions within IVE's should be designed, and efficacy of different evaluation methods.
2. A focus group of various field experts, which would permit the free and immediate exchange of ideas, upon which new research avenues could be discovered. This type of study could generate a great deal of qualitative data as well as further the research of the focus group members through ideas gained in the collaborative process.
3. A comparison study from observations of users within different IVE's could help determine which designed elements are useful in practice.

These are just a few examples of future studies that could be conducted. Each, in turn, would generate more new studies, bringing us closer to a conceptual framework for designing instructional virtual realities. For now, the most important thing is to keep studying this area, sharing ideas, and building on each other's work.

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Critical Viewing and The Significance of The Emotional Response

by Carrie Rood

This paper argues that the objective evaluation of visual images, employing critical viewing skills, as advocated by the visual literacy movement, disregards the significance of the emotional-aesthetic experience between subject-object relationships.

Critical viewing is a concept that was developed in the 1970's after the advent of the first television generation. John Debes (1986) in the forward to Richard Sinatra's book on visual literacy recalls, "the visual literacy movement sprang up because observant educators and scholars were puzzled by changes they saw in young children after television had arrived in the average American home" (1986). We are now in the age of the visual image. We are dependent upon television for global information and we are inundated by visual messages in books, magazines, and newspapers. The sheer volume and omnipresence of the visual image has caused considerable concern and speculation over recent years. Visual literacy advocates the implementation of a set of skills in order to interpret the content of these visual images, their social impact, and their ownership . Visual literacy involves three abilities: to visualize internally, to create visual images, and to read visual images (Feinstein, 1993). Within the scholarly debate about the value of visual literacy is the belief that the acquisition of visual literacy bestows the skill of critical viewing. "Learning about visual conventions...gives the viewer a foundation for heightened conscious appreciation of artistry; second, it is a prerequisite for the ability to see through the manipulative uses and ideological implications of visual images." (Messaris, 1994 p. 165)

Critical viewing draws on the traditions and mystique of what critical thinking offers. Critical thinking involves the justification of beliefs, and argumentation is the vehicle by which justification is offered (Kurfiss, 1988). Proponents of visual literacy have specifically linked four areas of study directly to the theories of visual literacy: Anthropology, Linguistics, Art, Philosophy (Hortin, 1980). Critical thinking can be traced to the Greek philosopher, Socrates. Although Socrates wrote no books, his philosophy has had a profound affect on Western philosophy through his influence on Plato and Plato's pupil Aristotle. Socrates' contribution to philosophy was his belief in objective understanding and rational argument.

Kurfiss (1988) states that critical thinking skills are imperative for citizens of the 20th and 21st centuries because for the first time in history we have the ability to destroy all life on earth depending on the informed decisions we make. This observation leads to the question: in a world where the ratio of the visual image to text is increasing how will the justification of beliefs take place?

According to Barry Berger, critical thinking analyzes persistently and objectively any claim, source or belief to judge its accuracy, validity or worth, (Considine, 1992 p. 19). Argumentation is such an important feature of public and private life, skills for constructing and evaluating arguments are valued as educational goals. In modern times, Dewey, Glaser, Ennis and Piaget have all contributed to the implementation of contemporary critical thinking instruction. Three perspectives dominate current literature on critical thinking and its development in college: argument skills, cognitive processes, and intellectual development (Kurfiss, 1988). I have presented a brief overview here.

Argument Skills

Dressel and Mayhew (Young,1980) summarized critical thinking as a set of skills for analyzing and constructing arguments.

1. Ability to define a problem
2. Ability to select pertinent information for the solution of the problem
3. Ability to recognize stated and unstated assumptions
4. Ability to formulate and select relevant and promising hypotheses
5. Ability to draw conclusions and judge the validity of inference

These skills clarify the forms of argument and provide a framework to identify fallacious arguments.

Cognitive Processes

Cognitive psychology examines knowledge as information processing. This theoretical model of cognition has provided a framework for understanding reason, attention, perception, memory, judgment imaginative thought and speech. In the context of intellectual activity, Dewey, Langer and Arnheim have all contributed to the concept of the informative and communicative character of visual elements. The term "schema" is used illustrate the structuring and frame of reference for perceptions received from the external and internal world.

Cognitive psychologists believe a learner constructs a mental model (schema) of the situation the model is organized around, and a claim or thesis is supported by reason and evidence. Cognitive psychologists consider critical thinking as a natural part of the construction of meaning (Kurfiss, 1988).

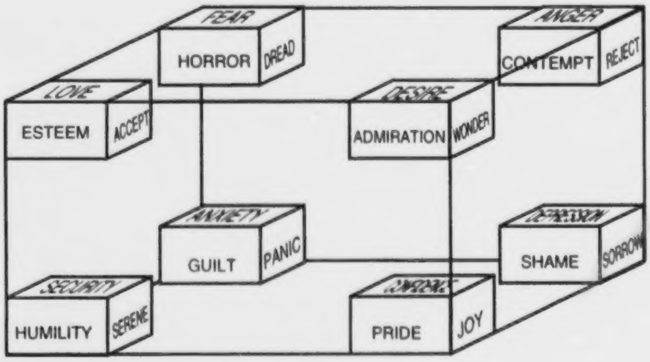
Intellectual Development

The justification of a particular belief enables the learner to assess opinions in a relativistic world. The skills of critical thinking enable the merits of a particular opinion to be discussed, but not necessarily agreed upon. Thus, intellectual development occurs as the manifestation of a contextual theory of knowledge through the application of critical thinking skills (Kurfiss, 1988).

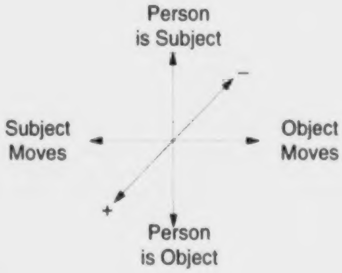
Much like critical thinking, critical viewing is not just a list of analytical skills. Indeed, critical viewing is the ability to: analyze the accuracy, validity and worth of the visual message by examining issues of content, form and style, social impact and ownership. Conspicuous by its absence in the above definition of critical viewing is a framework of analysis to explore the experienced emotional response to the visual image.

The word emotion is derived from the Latin "emovere," which means "to move out." Characteristically emotion is a word to describe the experience of being moved. We have an impulse to outward expression. Across time and culture various theories investigate the phenomena of the emotional experience from differing viewpoints. Here, the central feature of emotion (how we experience emotion, as passively moving us, while at the same time that it is part of us) is examined by De Rivera (1977) in his structural theory of emotions. De Rivera's theory is of particular relevance in describing the human emotional response to the visual image.

According to the structural theory of emotions, the emotional experience is a paradox. We are passively being moved rather than acting and yet the movement seems to be coming from within us. An emotion is no passive reaction to a stimulus, but the transaction between the individual and his environment. In the following illustrations, De Rivera (1977, p. 67)


FEAR
HORROR
DREAD
ANGER
CONTEMPT
REJECT
LOVE
ESTEEM
ACCEPT
DESIRE
ADMIRATION
WONDER
ANXIETY
GUILT
PANIC
SHAME
SORROW
SECURITY
HUMILITY
SERENE
PRIDE
JOY

Matrix of Emotions


Person
is Subject
Subject
Moves
Object
Moves
Person
is Object
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diagrammatically represents the juxtaposition of subject-object inter-relationships in an emotional matrix of 24 emotions.

"When we examine individual emotions they reveal different types of movement and these different types suggest that an emotion is not an isolated entity, but rather part of a system that governs object-relations, a structure, which can only be explained if we use the dyad [the person and the other] as the unit of the analysis" (De Rivera, 1977 p.12)

The subject of an emotional movement is always the person experiencing the emotion. It-emotions are emotions focused on external objects. Me-emotions are focused on the person. "Each particular emotion is the result of choices which organize our relation to an object. Thus emotions have features in common with perception. Both consist of active behavior on the part of the individual even though neither is outwardly visible as such. In both, a certain object involves the self "moves" him to such internal activity which does not realize information perceived from the outside world as such but transforms it to be meaningful to the relation of the individual to the world" (Sava, 1981, p. 11).

The structural theory of emotions considers emotions the internalized relation to the world, to people, nature, art, etc. The emotional experience reflects the transformation of our relation to the world (De Rivera 1977). The transformations are the movement of emotions. Each type of emotion reflects a different kind of transformation. Each emotion involves its own transformation in relation to the world and is interrelated to all the other emotions.

If we are moved to action, through our emotions, the dynamic emotional reaction to the visual image, as described by De Rivera, deserves consideration. A certain emotional reaction that an object produces in an individual is characteristic of the aesthetic experience (Sava, 1981). According to the Oxford English Dictionary, aesthetic derives from the Greek word meaning "feel, apprehend by the senses." Aesthetics is a branch of philosophy that deals with whether qualities such as beauty and ugliness are objectively present in the mind of the individual or whether such qualities are objectively present in the things they appear to qualify. According to De Rivera's structural theory of emotion, aesthetic perception, experience or appreciation would not be discreetly present in the subject or the object but inter-related. Sava points out, "Aesthetic perception, experience, and appreciation are influenced both by the preceding cognitive and emotional experience of the subject and by the characteristics of the object (1981).

The aesthetic can be defined as a particular mode of apprehending and responding to experience. "The aesthetic is a mode of intelligence working not through concepts but through precepts, the structural elements of the sensory experience and that the arts are the symbolic forms for its deciphered elaboration and development (Abbs, 1989 p. 76). The arts are dependent on the aesthetic modality because they operate through it (through the senses).

Mandel states, "Art uses emotion to hold and stimulate the audience," (1967 p. 80). The advertising industry uses the emotionality of the artistic tradition to exploit the consumer. Until the 1950's the advertisement industry "mainly stressed the product's characteristics and benefits. Emphasis gradually shifted to gathering and applying information about purchasers,"(Kervin, 1990 p. 16). Advertisers sought out artists to support their product campaigns, in order to influence specific target audiences.

"We may be unaware of the work done by advertising creators to gain our attention and *positive response* [emphasis added], and by ourselves as we decode and interpret advertisements, "(Kervin, 1990 p. 8). Kervin in the article titled: "Advertising and Persuasion from Logical Argumentation to Seductive Ambiguity," explains that the very ubiquitousness, and economic importance (and therefore probable continuance) of advertisements suggests that we should critically evaluate advertisements. Will critical viewing assist the viewer here? Are the skills involved in critical viewing sufficient?

Earlier in this paper, is was pointed out that the main objective of critical thinking and critical viewing centers on the quality of critical reasoning, skill of analysis, and the construction of argument/visual image. Where is the school of philosophy to provide skills to interpret the influence of the visual image beyond objective analysis? "Failure...derives from an inability to differentiate the arts from other disciplines in such a way that they are established as autonomous forms of inquiry, unique disciplines of understanding with distinctive traditions." (Abbs, 1989 p. 76).

Persuasive communication can be considered a form of argumentation. Literature from the school of rhetoric suggests that arguments can vary as to how clearly a proposition is presented and as to the weight given to logical versus emotional proofs, the former objectively, the latter verifiable subjectively. Mills states that, Aristotle's three avenues of persuasion for speakers delineate persuasive techniques in arguments as: ethos, exhibitions of communications credibility, pathos, emotional appeals, and logos, support of a logical nature (Kervin, 1990 p. 17).

Argumentation can involve one, two or all three proofs. Advertisers choose one or a combination of proofs depending on the communicator, message, situation and audience. Advertisements, through their use of visual codes, create a context for their

ARGUMENTS

Logical Proofs ———— Emotional Proofs
Factual Narrative

Conventional
Emotional
(Ambiguous) *Nonconventional*

products. Visual codes are rules guiding choice and arrangement of elements within a message. Arguments ranging from logical to emotional proofs and codes ranging from conventional to nonconventional have been schematized diagramatically by Kervin (1990 p. 18).

Using critical viewing skills based on logical deductive reasoning to evaluate visual images fails in the arena of advertising where persuasive techniques are presented through the modality of aesthetics.

Kervin observes that ambiguous advertisements present the "argument" dependent wholly on emotion; the coding is very nonconventional. "A factual, narrative or non ambiguous emotional advertisement may be overtly accepted or rejected because it is critically assessed... At the opposite end of rational thinking are ambiguous advertisements... This type of advertising seems in particular to suppress consumer's critical thinking, appealing primarily to senses and feelings." (Kervin, 1990 p. 38).

Images are deemed successful to the degree that they move us. Characteristically, emotion is a word to describe the experience of being moved from within. This is the significance of the emotional response. The skill of critical viewing does not necessarily lead to the objective understanding of images beyond their ability to influence, because the emotionality of aesthetic subject-object relationships is not addressed.

The visual literacy movement originally advocated that visual images could be repositioned within the framework of critical reason and thought, and thereby immunity from influence would be provided. The task is misconstrued: the skills of critical viewing are insufficient. If we function by an emotional schemata and the process of critical reasoning, the tools we need to decipher our experience are to be found not only in the objective analysis of the isolated visual image but in our continued self awareness of the emotional response. Not to acknowledge the emotionality of the aesthetic visual experience misrepresents our experience, and subverts the value of critical viewing skills.

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Tying Theory To Practice: Cognitive Aspects Of Computer Interaction In The Design Process

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Dennis M. Dake

Marshall McLuhan in his 1965 book, Understanding Media coined the evocative phrase, "The medium is the message." According to McLuhan, the medium is the thing that affects changes in everyone who comes in contact with it. This transformation of human interaction with the environment is caused because, "it is the medium that shapes and controls the scale and form of human association and action" (McLuhan, 1965).

McLuhan suggests that any extension of the senses (new medium) effects the whole psychic and social complex in which the individual lives. In the second half of the 20th century it is the computer and its worldwide interlinking of networks that pose the greatest challenge to the human nervous systems of users. For visual designers the challenge is pervasive. The medium of computer -aided design is a dramatic departure from older and more traditional visual design media. This new medium requires changes to the creative problem -solving methodologies employed in the development of new visual designs. This paper proposes a new pattern for creative problem solving, responsive to the medium of computer aided visual design.

Linear Descriptions of Creative Problem-Solving

Descriptions of the creative problem solving process have changed little, in structure, since the late nineteenth century when the German physiologist and physicist Herman Helmholtz described the stages in his own scientific discoveries as saturation, incubation, and illumination. In the 20th century, theoretical statements on creative problem-solving have proliferated. One of the most influential was formulated in 1926 by George Wallas who defined the creative problem-solving process as consisting of four successive stages:

1. preparation (collection of preliminary work searches, and researches);
2. incubation (a period of vary-

ing length between external preparation and illumination where the prepared material undergoes subconscious organization and elaboration);
3. illumination (sudden, clear insight that comes unbidden); and
4. verification (critical study and evaluation to confirm the illumination) (Wallas, 1926).

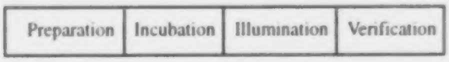

Figure 1. Creative Problem-Solving Process
Wallas 1926

Since Wallas, traditional definitions of creative problem-solving processes have added some stages, subtracted some, or shifted them in order of presentation. In 1953, Osborn formulated one of the best known modern theories of problem-solving that included seven stages.

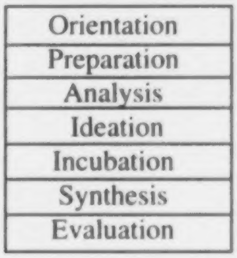

Figure 2. Creative Problem-Solving Process
Osborn 1953

These traditional models have one thing in common, a linear pattern. From initiation of the process to refinement of a successful product the pattern is linear, as if moving along train tracks. Such linear processes have been confirmed by many reports from creative individuals and through psychological studies. These models give to productive and infinitely variable human creative experiences an orderly pattern and communicable structure.

One such current model within design education has been developed by Iowa State University professor Fred Malven (Malven,1989). Designed to help beginning visual designers develop a research orientation, prior to formulating possible solutions, this current reincarnation of the linear creative problem -solving process has been dubbed the PATHWAYS model. This acronym stands for:

Problem Definition - Recording the problems that currently exist and stating general goals for improving conditions.

Analysis - Listing specific minimum (and optimum) requirements which a successful solution must satisfy.

Theory - A set of beliefs as to how the environment potentially influences the desired outcome (cause-effect relationships- "If I do X the result will beY").

Ways -Concepts (ideas) for using the stated theory to satisfy stated requirements.

Solution - Based on the most promising concept(s), a single solution that does the best job of solving the stated problem.

As the 21st century approaches, new visual design media, such as computer graphics, are drastically altering the environment in which visual design is conducted. It is our contention that, in order to understand generative processes in the computer environment, designers need to substantially alter their visual design methods to take into account and maximize the unique strengths of the computer as a medium.

The Strengths And Challenges Of Computer Applications

There is little debate over the necessary integration of computer applications into design education. If college graduates are to be viable candidates for employment, they must possess a minimum understanding of computer technology. The Foundation of Interior Design Education Research, the national accrediting body for interior design programs, requires students reach minimum levels of awareness, understanding, or competency for each established area of the interior design curriculum.

2.12 Communication Skills

Visual presentation skills are essential for the communication of design concepts. Exposure to a variety of media allows experimentation with new ideas, broadens the scope of creative expression, and allows discovery of the best means of portraying the individual's thought processes. Oral and written presentation skills must be practiced to give added depth to the visual presentation. Computer literacy promotes continued growth and development in communication variables (FIDER, 1995, p.8).

Figure 3. FIDER Standards

Computer-aided design and drafting, word processing and computer graphics must all be introduced and students led to understand the potentials each application offered.

Unfortunately, the minimum level of understanding does not prepare students for real world applications. A minimum understanding of computer applications involves neither critical nor creative thinking. Rather, it focuses on rote skills while reinforcing a linear problem-solving process. Most educators will agree that students must go beyond understanding to a level of competency if they are to remain competitive in today's technological market. We, as educators, are just beginning, however, to understand the impacts of computer applications on traditional pedagogy and methodology. This paper presents possible alternatives to the traditional learning processes currently implemented with computer applications.

Strengths of Computer Applications

Computer-Aided Design

In its infancy, computer-aided design programs catered to structural and electrical engineering "sav(ing) students from doing the tedious number crunching and the iterations of structural design" (Gal, 1994, p.338). During its introduction to architecture and design fields, it was originally termed computer-aided drafting. Users focused on the computer's capability to accurately and quickly output presentation and construction documents. Sophisticated users quickly realized, however, the computer's potential for design development and process work.

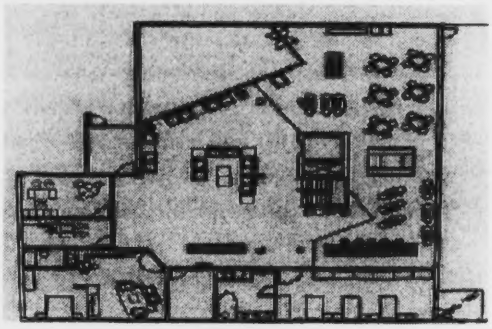

Figure 4. Ski Lodge Floor Plan (student work)

The term computer-aided design currently describes everything from programming and project management through design development and documentation. Design is not specific to the fine or applied arts. Rather "designing demands of students the effort to conceive and refine aesthetically pleasing and useful artifacts, whether they write essays, draft plans ..., compose music, develop organizational schemes, devise historical narratives, create algorithms ..., or plan decisive sequences of scientific experiments" (Ehrmann, 1987, p.10). Virtually all aspects of problem seeking and problem-solving can be addressed through the computer.

Modeling

Three-dimensional study models play a significant role in the design development process. For each given problem, students are encouraged to explore a variety of solutions both in two-dimensional drawings and three-dimensional models. Historically, this meant laborious and often tedious modifications to understand the subtleties of a design detail. Unfortunately, students often ran short of time and motivation during this lengthy cyclical process.

Computer generated wire frame surfacing and solid modeling offer students the ability to manipulate a three-dimensional image or design in a fraction of the time. Students can alter forms and generate new ideas that help them to better understand their applications of the principles and elements of design. As with structural and electrical engineering programs, students were able to perform multiple iterations in less time, and with greater accuracy.

Internet

Internet access breaks down both real and implied boundaries of traditional classroom learning. The global connectivity available through the internet allows educators and students the opportunity to interact electronically with people and resources that were previously unavailable. The idea of remote learning is becoming more viable as students interact with outside educators and practitioners through personal computers and internet links.

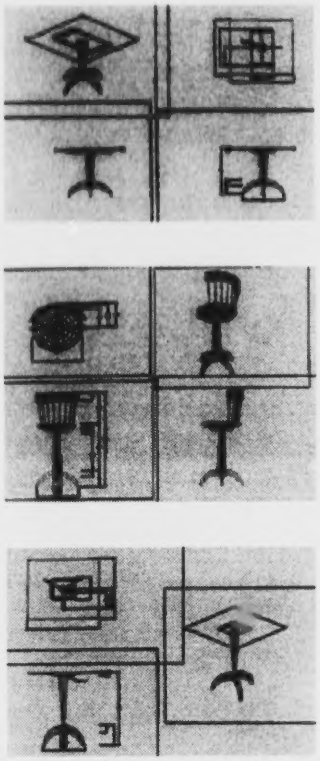

Figure 5. Furniture Design
(student work)

In addition to serving as a global warehouse of information, with students accessing libraries and databases (what might be considered a linear process), the internet also supports a more cyclical exchange of information. Newsgroups and bulletin boards offer opportunities for uncovering new resources as well as providing a forum for reporting on one's own discoveries. This multi-tiered, cross discipline exchange of information is a collaborative learning process that emphasizes interactivity.

Challenges of Computer Applications

Challenges to computer applications can be seen in attempts to execute complex design ideas and the memory and speed limitations of hardware. Quite often students are able to generate complex ideas and designs but fall short in their ability to express those ideas graphically. Actual model building helps in providing visual, three-dimensional trials on a given design solution. The traditional materials (bristol board, foamcore, knives and scissors)are familiar to students and easy to manipulate. On the other hand, computer-generated models often compound the complexity of problem-solving by requiring an understanding of computer software programs prior to application and testing of design ideas. Not only must students understand the computer commands necessary to perform the exercise, they must also comprehend the value of each command in achieving specific goals and solving complex problems.

Perhaps the greatest challenges in integrating computer applications into the traditional classroom resides in the limitations of the computer hardware. Most institutions of higher learning work on and with computers that are less than "forefront" technology. In order to utilize many of today's graphic and design software packages, computers must be faster and provide greater memory storage. Unfortunately, upgrading hardware is both time-consuming and costly. Quite often faculty are left the challenge of merging new software with old hardware or vice versa. As educators, we are forced to develop better and faster ways to reach our objectives, while working within the constraints set by the computer hardware.

In addition to software and hardware challenges, lies the burden of accountability on the Internet. Unfortunately, as the collaborative exchange of information grows, so does the difficulty in accessing reliable and authentic information. There are currently no restrictions on who can put what on the Internet. Students must be prepared to dig for and verify all information they uncover. The user must creatively search out and critically assess all information for authenticity.

Theory: Linear vs. Cyclical Design Processes

If students are taught that the computer is just another tool among many more traditional design tools, its unique strengths are not well utilized. "The computer is not just another tool for making education more efficient, but a catalyst for reconstructing the whole learning curriculum" (Balzano, 1987, p.83). Computer-aided design, with its worldwide interconnectivity, lightening speed, and immense potential for the storage and retrieval of information, highlights the inadequacies of the traditional linear models of creative problem-solving. If the medium is the message, then a linear, standardized process will not work equally well in all environments, non-electronic and computer mediums alike.

Learning even one computer program well, is a complex proposition. In computer-aided design (CAD) several program applications are typically needed. This exponentially compounds the time required within the design education curriculum to gain proficiency. A long learning curve threatens to overcrowd the design curriculum to the detriment of all visual media. Learning to use a rich mixture of traditional art materials already takes considerable time to reach a level of proficiency. Only when proficiency is gained can the appropriate tool be freely chosen in response to problem-solving needs.

One solution to the time pressures, caused by the introduction of computer aided design media, might be to move visual design education totally into the computer environment. Because computers represent such a drastically different medium, this would then require a change in creative problem solving paradigms to accommodate the unique nature of the medium.

The computer design environment is characterized by intense interactivity, a visually mediated form of thinking, a discovery oriented dynamic, and the empowerment of the individual as decision maker. These unique characteristics of the computer-aided design medium must be understood and incorporated into the creative problem solving process. Each of these characteristics suggest a radically different structure and pattern to problem solving: a cyclical process.

Interactivity

Every system (medium) impresses its assumptions on participants. A linear system suggests orderly sequential progression from stage to stage. Linear models do not utilize the interactive strengths of the computer medium, but rather move the product down an assembly line of inevitable steps to completion.

Computers as a system are more immediately responsive and continually interactive with the operator. There are inevitable moment-by-moment opportunities for synthesis of material and divergent explorations. Computers are open systems, highly receptive to the environment. Networking increases this interactivity and extends it to the whole world. Networking provides access to vast amounts of data that can enrich the problem solving process. New ways of thinking need to be developed to maximally utilize these new interactive patterns that are made possible with computer media.

"To understand the full dynamics of shapes and forms created by artists and designers on the computer, one needs to understand how these new tools can be used in the creative process. The capacity to change and alter images is far different when using a computer than when using a paintbrush or drafting tools. The biggest difference is the ability to rotate, move and animate objects on the computer screen" (Van De Bogart, 1990, p. 307).

As visual possibilities multiply, through playful experimentation and manipulation of images on the screen, the older linear problem-solving processes quickly become too static. Linear problem-solving does not provide for the continual shifts in context of information when something new is discovered "out on the net." To be successful in the computer environment the designer must be continually generating new strategies for further exploration. Computers are more organic in their operations and rigorous controls over the process stages unduly restricts further visual exploration of possibilities.

Visual Thinking

Visual information is processed holistically within the human brain, rather than linearly. To work effectively, then, on a problem calling for visual-spatial manipulation and solutions requires a high order of what psychologist Rudolf Arnheim has called, visual thinking. At each stage of the problem-solving process there is a need for wholeness and synthesis.

In visual thinking, pattern seeking becomes vital if the designer is to be able to "see" and comprehend what is actually taking place. This shift from moving through linear steps to continual pattern seeking as a mode of discovery and educational inquiry, is exactly one of the effects of electronic technology predicted by Marshall McLuhan in 1965.

The multitude of manipulations and variations made possible by the computer are expressed instantly on the screen in concrete representational symbolism. These multiple variations, in turn, create an accumulation of decision tensions among possibilities. All these possibilities are the raw material for reflection, combination, and synthesis into a finished product of novelty and aptness for the problem at hand. In order to bring about a productive hybridization of ideas, the designer needs a disciplined, structured, yet playful exploration of visual possibilities. Out of this disciplined play with visual configurations the underlying structural patterns of the problem surface and become visible and accessible.

Discovery Orientation

Playful, creative discovery is an open-ended discovery-oriented process, seemingly without strict rules of causation. In creative play the human can discover patterns, see contextual relationships to the problem, and eventually hope to make decisions among the many variables discovered.

Working within the computer environment (medium) naturally contributes to this important discovery orientation. With its enormous capacity to support and promote variations, the computer encourages exploration. In addition, the interconnectivity of individual computers through local and international networks breaks down traditional disciplinary boundaries and opens up new possibilities of discovery. Information and perspectives from disparate fields of knowledge are now immediately accessible to the designer working at their individual work station.

The process of visual design is not an objective process, with set rules and standards. The process is interactive within the designer, with the world, and finally with the viewer. Such a disciplinary process needs to provide a number of important characteristics for the designer: discovery at every stage, acceptance of an ingrained ambiguity to the outcome, and unpredictability of goal attainment. The designer must remain open to new discoveries.

Personal Affordance

Both the designer's needs for an original perspective and the larger human needs factors of the design audience must be made an integral part of any visual design process. The designer is not a neutral, detached observer of the design process. The designer is interactive with the developing design idea just as the design client or consumer will be interactive with the finished design product. While creative people need to take chances at each step in the process, they also need security and assurance that the effort being expended will eventually result in a fruitful and productive direction.

One reason that the computer environment is so inherently interactive and engrossing is that the patterns on the screen are essentially patterns projected directly from the mind of the computer operator. This means that the designer/operator must have, at each stage in the problem solving process, a whole and complete sense of personal attachment and meaning. This personal affordance or connection must be continually made with the data flowing into the process. A sense of personal connection or affordance must be a vital human component within the design process.

ETC: Express - Test - Cycle

Robert McKim in his 1972 book, Experiences in Visual Thinking, suggested that the process of generating creative visual forms required a cyclical process of projection, evaluation, and ongoing discovery. He named this graphic ideation process ETC (Express, Test, Cycle).

"Graphic ideation utilizes seeing, imagining, and drawing in a cyclic feedback process that is fundamentally iterative. I have given this 'feedback loop' the acronym ETC (etcetera) to dramatize the importance of repetitive cycling to the graphic development of visual ideas" (McKim, p. 117).

Making a graphic image on the computer screen lets the designer literally Ex-press or externalize visual imagery from the brain and press it in concrete tangible form. Once projected into visible form, ideas must be carefully and critically evaluated (tested) for potential usefulness. If this critical examination is not to short-circuit the on-going design process however, McKim suggests that an integral part of any graphic ideation process must be another round of idea expression. The initiation of this new round of expression is based on knowledge gained from the first round. The process "grows and learns" as it develops. This circling, growing pattern of expression and testing, within the computer environment, leads to a layering of cycles that we call the "layered cycles" approach.

The Layered Cycles Approach

The layered cycles approach to problem solving involves the use of both macro and micro cycles of expression, testing, and cycling. The way to stay productive and creative, within a computer environment, is to pursue an overall process (ETC macro cycle) moving dynamically toward effective creative solutions. But within this macro cycle, the interactive computer environment presents, minute by minute, new sources of information, new contexts to be incorporated, and new possibilities and variations that suggest a reopening of the problem solving process.

Each of these minute-by-minute opportunities is itself a cycle, an ETC micro cycle within the larger, moving toward successful completion. It is suggested that each micro cycle must move through the Express-Test-Cycle feedback loop to keep the macro cycle open to creative exploration and discovery.

"The output of the design process is "determined by a process of continuous exploration. At all decision nodes, orientation is guided by a new (and possibly just discovered) goal" (Beyls, 1991, p. 313).

Each micro cycle should reinforce critical/contextual thinking and personal affordance connections to meaning and heuristic motivation. While the macro cycle moves dynamically toward creative solution, each micro cycle keeps the process open to further creative exploration and discovery, thereby maximally

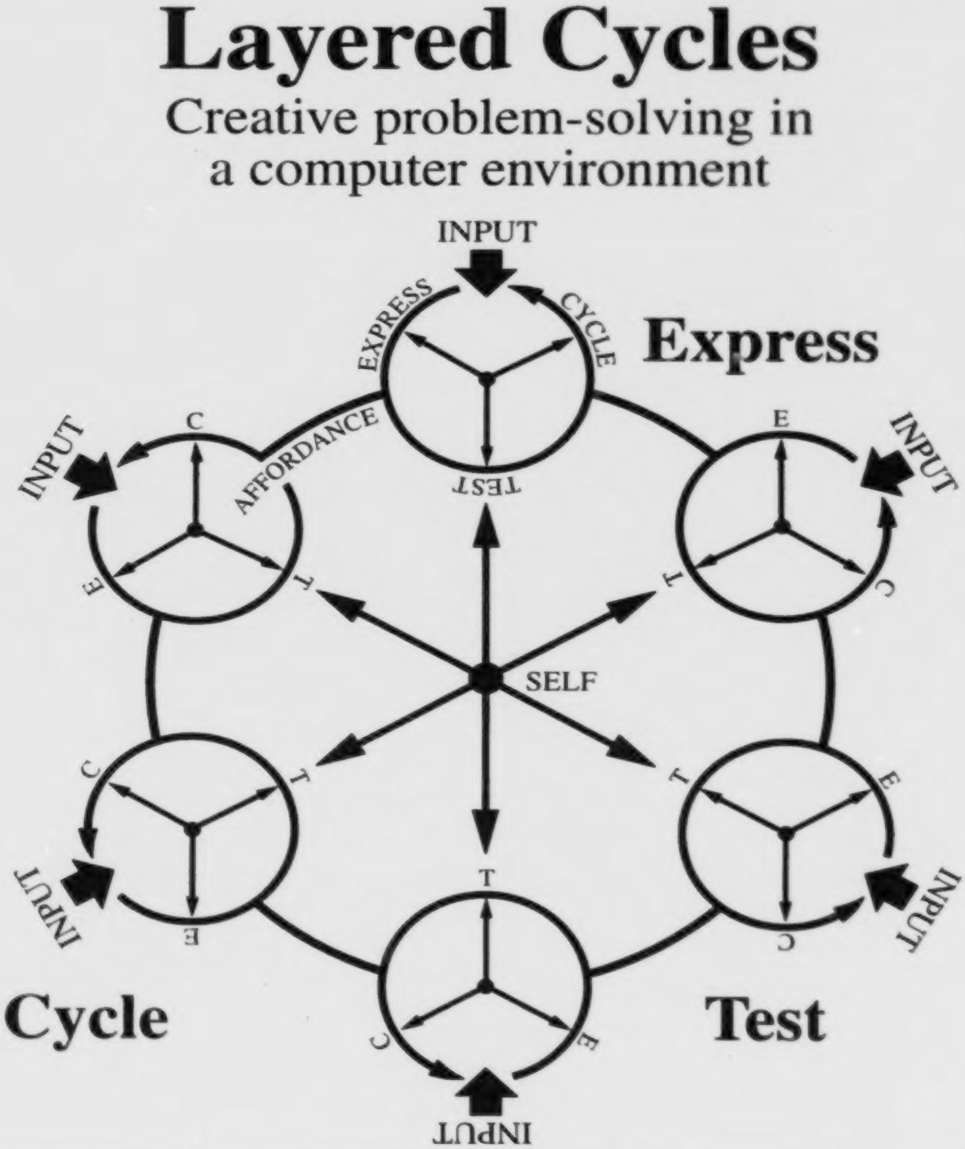
Layered Cycles
Creative problem-solving in a computer environment
INPUT
EXPRESS
CYCLE
Express
AFFORDANCE
TEST
INPUT
C
E
T
SELF
Cycle
Test

Figure 6. Layered Cycles Approach
Mikovec & Dake 1995

utilizing the unique strengths of the computer medium.

As micro cycles pile up upon one another, the macro cycle is both supported and enriched. The individual designer is continually and individually empowered to explore and integrate new information and possibilities until a maximally effective solution is generated. This layering of micro cycles upon a macro cycle is a new information -processing system. The "layered cycles" approach is a new pattern of problem solving medium needed to fit with the new relationship to computer media.

Putting Layered Cycles Theory Into Practice: Results From Classroom Pilot Tests

Background in Interior Design Education

Prior to 1980, design education relied on manual skills. Along with theory and methodology, students were instructed in graphic communication skills. Students learned how and when to use mechanical pencils, pens, color media, paraline bars, t-squares and triangles. These were roughly all the tangible tools a designer needed to complete the problem-solving process. It was all the designer had. However, during the early 1980s at colleges and universities across the country, computers were introduced as yet another tool for the designer's use. Computer-aided design and drafting software enabled students and practitioners to design and modify drawings, virtually in seconds and was seen as a miracle tool by many.

Within interior design curricula, students began using computers for simple two- and three-dimensional drafting. Orthographic drawings, plans, elevations, and sections, were easily input into computers, and provided the possibility for a greater level of accuracy. Errors could be easily corrected and time saved. Perspective and paraline drawings provided students with three-dimensional views of design solutions, while helping them to better understand form and space. Printers and plotters allowed for quick and reliable reproductions.

As use of computer applications grew, so did research on its potential. In its introduction, computers were used mainly for production drawings, as mentioned above. Little process or preliminary design work was done on the computer. Rather than isolate the computer as solely a production tool, academia began researching ways to integrate computer applications throughout the design process and the phrase computer-aided drafting was replaced with computer-aided design.

Many designers have explored the potential for computers in areas of visual ideation and creativity. Unfortunately, applications and use in preliminary and process drawings have been slow to catch on. Only the most open-minded users, comfortable with the computer interface, the use of a mouse or digitizer pen, have been able to achieve a level of sophistication and subtlety previously exclusive to manual applications. The computer does however hold tremendous potential for modification and iteration. Space plans can be modified, subtracted from, or added to with a few simple key strokes.

While the uses of computer applications have expanded to include three-dimensional modeling, color imaging, simulations, and virtual reality, little time has been devoted to methodology, the process design students follow in solving a visual or spatial problem. Traditionally our process models have been linear in sequence. The following pilot studies will show the modification of design process from a linear to cyclical sequence and lists the benefits and weaknesses of each as determined by the instuctor.

Fall 1993: Independent CAD Studio
(Linear Process)

As it was designed, the computer-aided studio focused on skill development. Emphasis was on "how" rather than on "why." The students participated in an office design competition that served as the studio project for the semester. While the computer is well-suited for office design, as there is much repetition of form and shape, there is a tendency for students to focus on the space planning (2D design) and not on the overall volume development (3D design). This course was restricted to interior design majors but was not-required for their graduation.

Benefits:
* Highly focused concentration of specific skills and technical information.
* 100% of studio time was devoted to learning the computer tools. (Use of output devices was also covered in the studio.)
* High interactivity between students in developing technical skills.

Weaknesses:
* No personal affordance or relevance which was specific to the individual student.
* Current pedagogy encouraged "child learning instead of adult learning" (rote skills vs. comprehension) (Braswell ,1994).
* Focus on two-dimensional space planning rather than three-dimensional design limited students' visual thinking and discovery orientation.

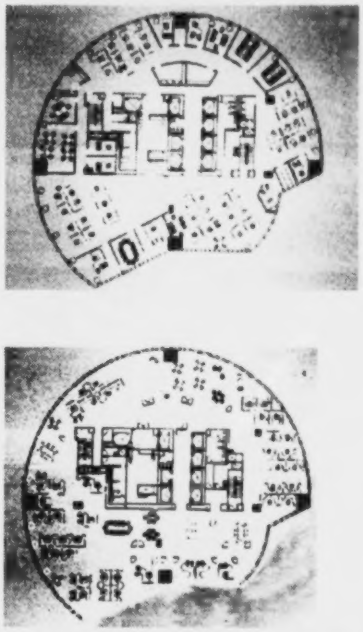

Figure 7. Office Design Competition: Floor Plans (student work)

Student perceptions summarized from evaluation forms:
* The product was more important than the process.
* Students often had the misconception that computer applications resulted in better design.
* There was little three-dimensional design done on or off the computer.

Spring 1994: Independent CAD studio
(feedback approach) (Koberg,1991)

In an effort to encourage creativity, students were required to integrate manual applications into their design process, reinforcing their acceptance of the computer as a tool. The feedback approach combines a linear process with a more cyclical process; a two steps forward, one step back approach. In this case the two steps forward were completed on the computer and the one step back were the integrated manual techniques. Students selected old NCIDQ (National Council for Interior Design Qualification) exams based on interest of subject material. Objectives for the course included full design development, as specified on the NCIDQ exam, from problem definitions through documentation. A furniture design component was added to the NCIDQ requirements to encourage more three-dimensional computer-aided design.

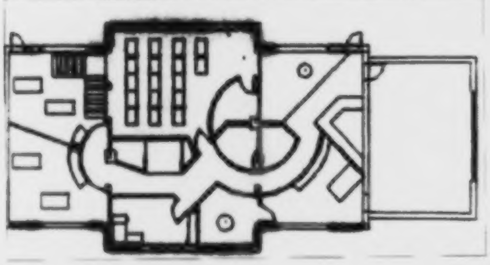

Figure 8. NCIDQ Exam: Artists Workshop Floor Plan (student work)

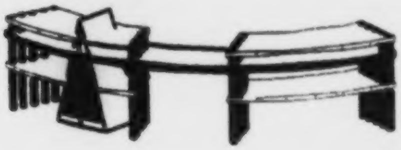

Figure 9. NCIDQ Exam: Artists Workshop Millwork Design (student work)

Benefits:

* The feedback approach more closely addressed comprehension rather than awareness in computer-aided design development.

* Design process was emphasized and less value was placed on product.

* Much greater level of interactivity between students and faculty on both computer skills and design issues.

* Allowing students to select their design problem made the process more personally rewarding for the students.

* Smaller scale furniture projects made visual thinking on the computer more viable.

* Encouraging students to integrate manual applications allowed them to fall back to more comfortable and familiar tools which increased their design discoveries.

Weaknesses:

* Small scale design problems were not taken seriously.

* Students did not maximize their time or design talents.

Student perception summarized from evaluation forms:

* Initial response to the integration of manual applications was positive, however as the end of the semester neared the response to integration became more negative.

* Projects for inclusion in one's portfolio became the driving force for the studio.

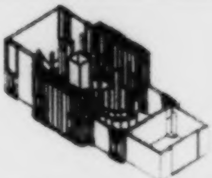

Figure 10. NCIDQ Exam: Artists Workshop Axonometric (student work)

Summer 1995: 3D CAD Workshop
(layered cycles)

The workshop combined the objectives of the traditional computer studio with less traditional computer and manual applications. High levels of interactivity, visual thinking, discovery orientation and personal affordance were key to the success of the pilot study. The "Macro Circles" for the workshop were 1) student selection of simple, small house plan from ten choices provided by faculty; 2) three-dimensional input of architectural information; 3) abstract manipulation of orthographic drawings; 4) vernacular addition to house; and 5) rendering and animation of addition. The "Micro Circles" were the expressing, testing, and circling of multiple ideas. Personal affordance were built into each macro circle as students self-directed their course of action. The workshop required no prerequisites, and was open to all university students of undergraduate and graduate level. Enrollment included students from the departments of mechanical engineering, construction engineering, architecture, and art and design.

Benefits:

* Elective summer course guaranteed some personal affordance and was strengthened by a student -driven syllabus. Problems were selected and modified based on students' own experience, background, and interest.

* The short four-week session allowed for a continual discovery process selecting, inputting, manipulating, exchanging, and outputting ideas.

* Diversity in academic backgrounds made each student the resident expert in their field and would eventually lead to high levels of interactivity.

Weaknesses:

* Interactivity between students from different departments was slow to develop.

* Difficult to manage such diversity in disciplines, skill levels, interests.

* Still product-driven. Students desired hard copies of work.

* Manual study models were unfamiliar and difficult for some students to build.

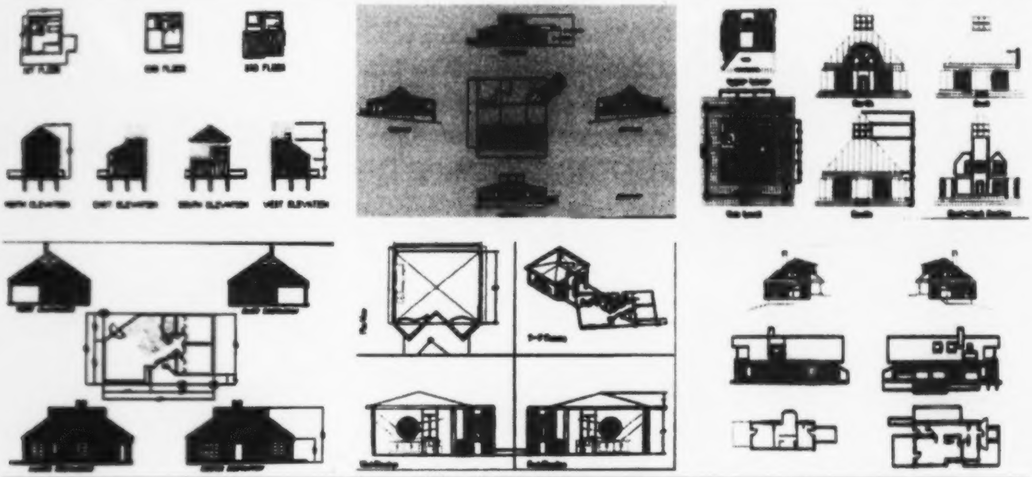

Figure 11. Orthographic Drawings
(student work)

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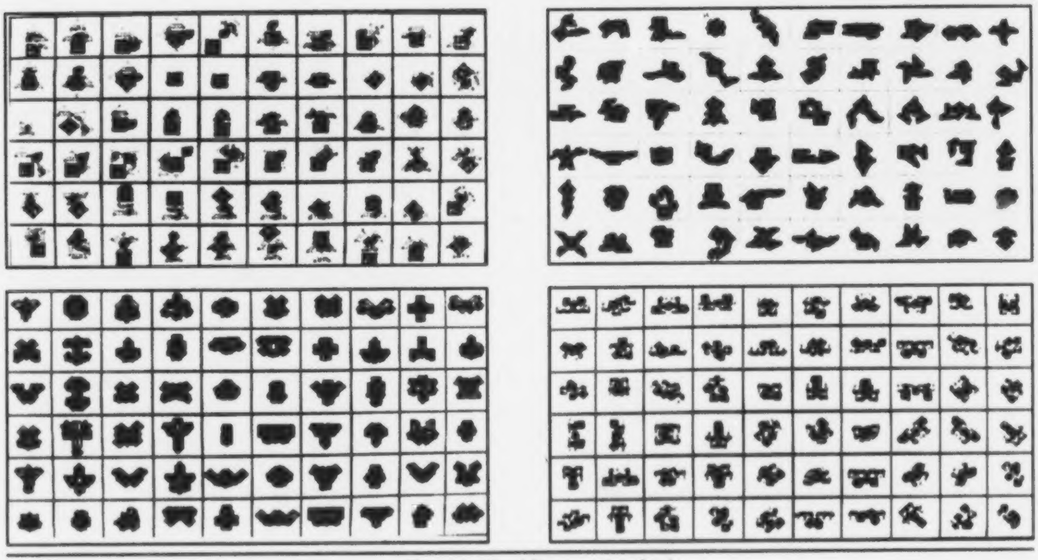

Figure 12. Abstract Analysis
(student work)

Student perception summarized from evaluation forms:

* Students enjoyed process work as long as they were able to generate a hard copy of it.

Students were not responsive to abstract analysis exercise. Did not see the relevance of such studies as sources for design inspiration.

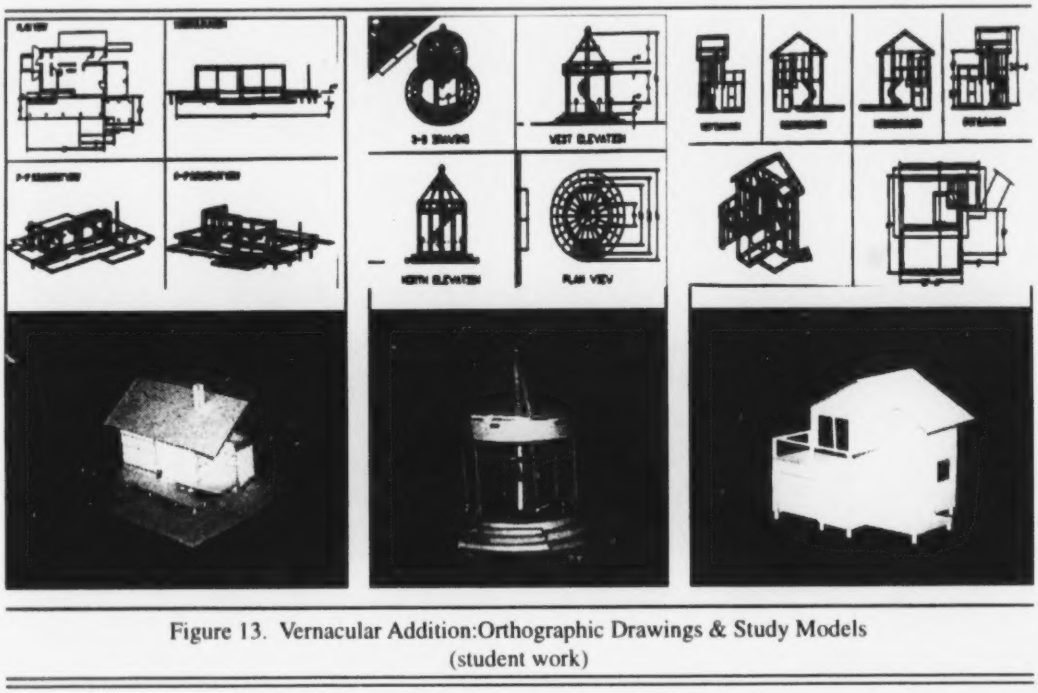
3-D DRAWING
WEST ELEVATION
NORTH ELEVATION
PLAN VIEW

Figure 13. Vernacular Addition:Orthographic Drawings & Study Models
(student work)

Future Directions: Integrated Studio (layered cycles)

While we have shifted from an independent CAD studio to a more integrated design studio, the interior design department at Iowa State University continues to struggle with the refinement of pedagogy. Currently, lower level studios remain more linear in their computer-aided design process. Students spend one studio day each week working on computer projects that may or may not relate to the concurrent manual studio projects. On the other hand, upper level courses are beginning to show signs of a more cyclical process. They address, with varying degrees of intensity, the issues of interactivity, visual thinking, discovery orientation and personal affordance, vacillating between computer and manual applications.

Some Tentative Conclusions

Work on the layered cycles process for problem-solving in a computer environment is still in the formative stage of development but based on several classroom, action research trials it appears that there are distinctive benefits in layered cycles for design students. Four conclusions particularly stand out as areas for further research and testing.

1. Effective use of the computer as a tool in the design process requires controlled exploration. While the computer offers an array of design possibilities and discoveries, the controlled explorations keep students from straying too far from intended objectives.

2. Controlled exploration in a computer environment must be compatible and integral with the nature of the electronic medium. Awareness of the limitations and advantages of any media results in a more creative use and critical understanding of the tool.

3. Computer-aided design is a particularly effective tool for managing, controlling, and maximizing a complex design process.

4. The layered cycles approach to creative problem solving is particularly productive in both encouraging students to explore a variety of inputs and take effective advantage of them as required by the specific, individual problem.

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The Impact Of Integrating Visuals In An Elementary Creative Writing Process

by Margaret Bailey,
Mary O'Grady-Jones,
Lynda McGown

". . . and what is the use of a book," thought Alice, "without pictures. . ."
—Lewis Carroll *Alice's Adventures in Wonderland*

Background

Consistent with Alice's lament, most children's books are filled with pictures. In fact story illustrations take up more space in children's books than words. When reading to children, teachers often spend time with students exploring and interpreting story illustrations. Yet when schools design curricula to teach writing, they often ignore the role of visual images in the writing process.

Historically methods for teaching writing have focused on text (verbal information) to stimulate story ideas and progress. Brainstorming and story webbing, for example, are pre-writing activities that traditionally call on verbal skills to organize a student's thoughts and ideas. Traditional models for teaching writing relied on a teacher's presentation of verbal information, student processing or writing, and teacher evaluation of results.

In 1983, Graves introduced a landmark study and writing curriculum in *Writing: Teachers and Children at Work* (1983). In his work, Graves proposed that teachers employ a process approach when teaching writing. His model supports the "natural" development of writing and expression that occurs in children. Graves presented the key steps in the writing process to include brainstorming, webbing, drafting, editing, and publishing. Graves also strongly supported student-student conferencing and teacher-student conferencing as essential events in the writing process. Since its introduction, many elementary writing teachers have adopted Graves' model.

Visuals in the Writing Process

There is little documented in the literature on the benefits or applications of visuals in the writing process. Research that does exist supports student illustration once the writing is completed. For example, the publishing stage of writers workshop (Graves, 1983) and programs such as "Young Authors" promote the use of visual images to enhance the story, yet they do not place any emphasis on the use of visuals in the *process* of writing.

In some cases, visuals have been used as a story stimulus. (See for example, Darlington, 1992). In such cases, a pre-selected image is presented to students as a means to generate writing ideas, evoke emotional expression, or reinforce descriptive writing techniques.

Surprisingly, the integration of writing and visuals is most often found in the science curriculum, where the combined use of sketching and note-taking is promoted as an observation tool (Srulowitz, 1992).

Technology and Writing

Computers and other media have been used to support the writing process. In most cases, these tools have focused on text and editing support, such as word processors and outliners. Bailey (1995) , however, makes a case for using visually rich presentation software (such as Persuasion, Compel or PowerPoint) as a creative tool in the elementary classroom. Creative writing is one of many suggested applications for presentation software in the elementary classroom.

Research Questions

This study was designed to measure the effects of the introduction of visual images, specifically computer clip art and graphic presentation software, throughout the writing process. Data was collected in two main areas: student motivation and reactions to the process, and quality/quantity of work produced.

1. Will the use of visuals (clip art) in the story writing process (webbing, drafting and editing) have an effect on the length and quality of student compositions?
2. Will the use of visuals in the story writing process have an effect on student motivation or esteem?
3. Will storyboarding impact the student's ability to organize thoughts into paragraphs?
4. How will students react to the use of computer presentation software to assemble and share compositions?

Method

Twenty-five second graders were the subject group for this study. The class was composed of 11 girls and 14 boys. The students were predominantly middle class Caucasian with one Korean. There was also one special needs student who was mainstreamed into the class. All of the students participated in the study.

The students had been working on writing skills since the beginning of the school year during a daily morning session called "writing workshop". Since this project began in April, late in the school year, an established set of writing rules and process techniques, based on Graves' (1983) process writing, had already been introduced and had been practiced through the development of approximately four prior themes.

Introducing the Project

The project began with a brief introduction to the students. During this time, the main features of this workshop were established. The students were told they would be writing a theme that included *both* words and pictures. The writing process would use the same steps as prior workshops. Critical new terms including "clipart" and "storyboard" were defined. In addition, students were introduced to the technology that would be used for the project, the pieces of hardware needed (computer, overhead projector and projection panel) and a special program, *Microsoft PowerPoint 3.0*, which would allow them to enter words and clipart together into the computer. To conclude the introduction, students viewed an example theme developed in *PowerPoint* by one of the researchers. The theme was shared using a Macintosh LC II computer. Students' questions during the introduction centered on understanding the technology and the new tools such as, "How do clipart (images) get into the computer?" and "Can we draw pictures on the storyboards?" The following steps were taken by the students over a four week period.

(1) Brainstorming. Copies of pre-selected computer clipart images (approximately 89 black and white images on four pages) were passed out to each student. Students worked with a writing partner to brainstorm theme ideas.

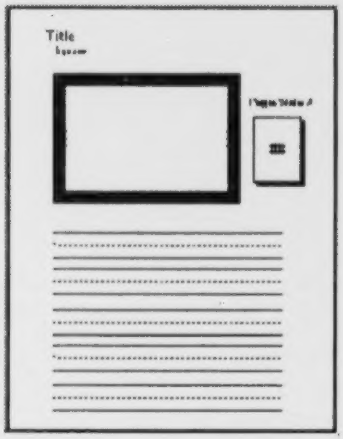
(2) Webbing. Once each student had decided on a theme, he or she began to draft a story web. Students wrote words or phrases, and placed images which explained and elaborated on their ideas on the web. Most students cut out and pasted their clip art choices directly to the story webs.

(3) Drafting. Students used storyboards as a tool to support the writing of their first drafts. Storyboards provided a place for both pictures and words. (See Figure 1.)

(4) Editing. Editing was done in peer groups, independently with the classroom teacher, and in daily sharing sessions. In the sharing sessions, students volunteered to read drafts while other students asked questions and gave feedback.

(5) Publishing. Once students had completed their editing and had approval from the teacher to proceed, students moved to the computer to publish their theme. Students worked with one of the researchers at a Macintosh LC II computer loaded with PowerPoint, the clipart, and the pre-created template to match the students' storyboards. Students directed the selection of background, placement and sizing of clipart, and the typing in of text. At the end of this stage, students were provided with a color printout of their theme.

Figure 1
STORYBOARD TEMPLATE
CREATED WITH POWERPOINT 3.0



(6) Presenting. All students had the opportunity to share their theme with classmates using the computer and PC projection equipment. During this presentation, each student read his or her theme from the printout while the computer generated graphics were projected on a cardboard "screen" suspended from the ceiling.

Data Collection

Data was collected over a four week period allowing the observers to be present for all of the stages in the writing process. Sources of information included observation notes, informal interviews with students, a final group debrief, teacher interviews, and document analysis-assessment of final writing by the teacher and researchers.

Findings

Observations of student reactions and behaviors during this writing workshop can be classified as being related to three key areas: (1) reactions to the *integration of visuals into the process*, to include strategies and approaches employed during the process and the resulting quality, and length of writing reflected in the themes generated from the process; (2) reactions to the *technology*, to include perceptions of the computer as a novelty in a pre-existing process and as a visually rich tool for accomplishing a familiar task; and (3) evidence of students' *motivation and esteem* during and as a result of the process.

Four Strategies for Visual Integration

It was apparent from very early in the observation that a handful of distinct styles were prevailing as strategies for integrating visuals into the writing process. This section demonstrates the four strategies we feel were consistently represented in this subject group based on notes taken during field observations and analysis of process documents including the writing webs, storyboards and final themes: (1) Visual Relationship, (2) Visual Organization, (3) Visual Sequencing, and (4) Trial and Error or Visual Testing. Pseudonyms are used to refer to the students.

Visual Relationship

The first example illustrates a Visual Relationship strategy, and describes Kimberly, a student with already well developed writing skills as demonstrated in earlier writing assignments. Kimberly's strategy for integrating visuals centered on looking across the set of clipart to identify relationships among the images. Once a conceptual relationship was identified, the student elaborated on the central idea, and the theme was organized to explain this relationship.

> *Example 1 - Visual Relationship.* Kimberly teamed up with Susan to look over the clipart images. They talked and started picking out images that were "funny", "cute" and "cool". It only took 5-7 minutes before Kimberly was ready to start a story web. She was able to recognize that some of the images were "realistic" and some were "cartoons." "The funny pictures made me think about being a cartoonist and making people laugh," she said. In the center of her web she wrote, "Being a cartoonist" and developed six branches. She pasted nine images cut from the clipart. The images were grouped in clusters. One cluster included a lion and a duck. Another included two cartoon dog images. A cat and fish were grouped together, as were a comical squirrel and bird. A solo image of a cartoon baby was pasted alone. Kimberly added sentences to her web to explain her groupings. The sentences centered on liking to draw "dogs" and "animals." One branch of the web included a rather poetic line that read, "I like to watch squirrels and birds dance among the trees." Even though the line didn't make it apparent, Kimberly said she was trying to explain how she got her ideas for drawing.
>
> Kimberly spent no more than one class session on her web, and was one of the first to move to storyboarding. Instead of developing each web branch into a single storyboard page, Kimberly grouped her ideas to fit three storyboards to support her explanations. She pasted the images on first, adding a new tenth image of a cartoon clock, and began adding the words to her rough draft. She restricted herself to the number of lines available on the storyboard, feeling "finished" when she reached the end of the page. She worked very quickly, and made very few spelling or punctuation errors. She

stuck to simple words and simple sentence structure.

The words and images included on Kimberly's final presentation bore striking similarity and consistency with her web. Very little changed in the final editing, or in publishing the theme with the computer. No additional brainstorms, or last minute changes were made during the computer time. Kimberly's final theme reflected ten images and nine sentences (a total of 74 words.)

Visual Organization

The second example demonstrates a Visual Organization approach to the writing. In this example, Brian used the visuals as icons to represent the structure and development of his theme. This approach involves using a single clipart image to "represent" a whole subset of ideas on the web and/or storyboard. Brian was an extreme example of visual organization, relying *completely* on the visuals to represent his theme's conceptual outline. In fact, he included *no words* on his web at all.

Example 2 - Visual Organization. Brian and Kevin sat down with the clipart and started naming the pictures. While Kevin centered on the shark, Brian couldn't decide on just one animal as his favorite. He began cutting out the ones he liked: the shark, a horse and a tiger. He pasted them on a web, each with its own branch. In the center of the web, he pasted the image of a globe. He put no words on the web at all. His teacher asked him to explain his theme. He indicated that he was going to write about animals around the world, and the three animals on the web were the ones he would talk about. He would tell where they live and what they eat.

Brian went straight to developing his storyboards to rough out his theme. He took five storyboard pages and numbered them 1-5, pasting the globe on first, the shark on second, and so on. He began writing, looking up some information in the encyclopedia, and he developed 1-3 sentences for each storyboard. He didn't feel restricted by the lines on the storyboards, naturally continuing on the back of the page as he wanted to add more information on each animal. Brian took risks with his vocabulary, including "information," "enemies," and "dangerous" to his draft.

Brian finalized his theme by adding a sentence to his introduction about where he found the information to his theme, and a short sentence as a conclusion. His final theme included only four images, but used 14 sentences (a total of 120 words) to elaborate and explain them.

Visual Sequencing

The third example demonstrates a Visual Sequencing approach to the writing. In this example, the clipart triggered a visual memory in Jeremy which compelled him to retell a story based on the "re-playing" of a visual sequence in Jeremy's mind. In Jeremy's case, it was a television show that formed the basis of his theme. Since Jeremy was relying on his visual memory to structure the theme, the clipart was used extensively as a planning tool to map his memory on the story web, but was thrown out during storyboarding, presumably because the clipart images could not match the richer images in the child's mind.

Example 3 - Visual Sequencing. Jeremy was a "loner" during the project, working very diligently the entire four weeks. When he first received the clipart and started talking with Sam, he centered right away on pictures of a sports car and police car. "These are cool." He took his paper and wrote "Viper" in the center. He started cutting out several images, one at a time. With each, he would paste the image, then write a single word. With a skyscape, he wrote "city." With a doctor, he wrote "crash." With a skeleton, he wrote "bad guy." He then added the "police car" and wrote "transform" by the sports car. In all, his web reflected eight images and nine words. He explained to his teacher that the images reminded him of a television show he had seen and he was going to write a story based on the show.

Once Jeremy had his story idea and his web completed, he abandoned the clipart images and began retelling the story on the storyboards. He would start each page with an illustration at the top, and then would fill each page with appropriate words and dialogue. It was as if he treated the box provided for pasting the images as a TV or movie screen. He took risks with his sentence structure, including dialogue and compound sentences. He took risks with vocabulary, too, including words such as "Chicago", "memory", "special", "bazooka", "alley" and "transform". He seemed anxious to finish his story. But he didn't feel like he could finish until the whole story was told as he remembered it. Finally, after 22 storyboard pages, his teacher convinced him to write a story ending.

Jeremy was one of the last to publish his story on the computer. It was a bit frustrating at first trying to find clipart images to match Jeremy's illustrations. Five of the original clipart images were used from Jeremy's web in the final presentation. Many were used over and over.

Jeremy's final theme included 15 different images, 63 sentences with a total of 558 words.

Visual Testing--Trial and Error

The fourth example demonstrates that not all students experienced a clear goal-directed strategy with the visuals. Some students struggled with visual integration and demonstrated what we call Visual Testing or Trial and Error in developing their themes. Missy is a good example of Visual Testing. In this approach, there were many starts and stops with selecting and integrating visuals into the theme. For some students, it can be compared to trying on shoes. The student centers on one or several images to start, develops the theme to a certain point, discovers new idea strands either stimulated by a thought or a new image, throws out visuals that no longer reflect the story's direction, and brings in new, more appropriate ones, all in an evolutionary trial and error process. This is in great contrast to the goal-directed behavior of the Visual Organizer or Visual Sequencer.

Example 4 - Visual Testing. When Missy received her clipart, she seemed overwhelmed by how many there were. She listened to her partner and the other kids around her to find out what they were doing. While other kids were deciding quickly, Missy seemed to have some trouble coming up with an idea. There were so many pictures that she liked. She asked the teacher, "Does this story have to be real?" (Most of their themes so far were information themes about themselves, Thanksgiving, interests and so forth.) "No. You can tell us a story or give us information about something. If you tell a story, though, remember all stories have a problem to be solved, a beginning, a middle and an end."

Missy wanted to tell a story and started her web by writing "The Dancing Bear" in the middle. She added a few words to the web including "room", "dances", "loved", "toys" and "best friends". Even though her story didn't have a problem yet, she started her rough draft/storyboard. She started by writing the limerick of Fuzzy Wuzzy, but threw this out and started over. It was the third class period that Missy really started developing her story. She began with an image of a house on storyboard one, and started writing. She didn't look back to her web at all. She used simple sentence structure, and made many spelling errors. But she kept going. On the second page, she pasted an image of a bear, and in the story named him "Fuzzy." She introduced six more images on page three, adding six more characters to her story. The action of the story was simple and occurred on pages 4 through 6. Even though her original web indicated there would be a dancing bear, this element was never introduced in her storyboard. It took Missy several class periods to complete her story. She made many changes, crossed out words, and added new sentences. She added new images, at times hand drawing when the "right" clipart was not available.

She worked most of one class period (about 40 minutes) to organize the story, select images for two storyboards that were left blank, and re-work the sentences to get the story into the computer with the help of one of the researchers.

Missy's final presentation used 10 images accompanied by 15 sentences with a total of 117 words.

These examples show at least four very distinct strategies used by the students in order to integrate visuals and text into a single cohesive theme. As evidenced by their final themes, this task was completed successfully, albeit perhaps easier for some. In all but two cases, when compared with writing samples earlier in the year, themes reflected risks used in the form of advanced vocabulary words and sentence structure, fewer misspellings, and longer length. Figure 2 compares the document analysis figures for the four students described in this paper.

Figure 2
EARLY WRITING VS. FINAL THEMES

Student	**Early Writing**			**Final Themes: Visuals + Text**				
	Words	Sent.	Misspell	Words	Sent.	Misspell	# Slides	# Clipart
Kim	96	13	0	74	9	0	3	10
Brian	53	6	6	120	14	0	5	4
Jeremy	90	14	2	558	63	1	23	15
Missy	117	15	3	143	25	0	7	10

Impact of Computer Technology

The technology, specifically the Macintosh computer with PowerPoint software used during the publishing stage of writing and the computer and projection equipment used for story sharing, did have some affect on the students' strategies and behaviors during the project.

While a computer in the classroom was not a novelty to this group (the students have access to an Apple IIgs for practice and enrichment), the introduction of a color computer with visual graphic software was a novelty. Further, it was a new experience for this group to use computers during the writing process.

Technology's Impact on Process

Since we brought in the computer on a wheeled cart at the beginning of each writing workshop, it was hard for students not to "notice" it. One or two students, like Jeremy, were able to shut out the anticipation of using the computer for final draft and remain very focused. However, a large number of the students, such as Kimberly, were obviously anxious to look, feel and experience the computer. We often observed students taking a break from their work to watch the interaction between researcher and student at the computer or to catch a glimpse at the colorful graphics other students were putting into their presentations.

For Kimberly, this eagerness was manifested in her writing by doing things "just well enough" so that she could be approved to advance quickly through the early writing steps and be the first to enter her final draft. For Kimberly, the results of this eagerness were a shorter paper than earlier writing (74 words versus 96 in an earlier sample) and less risky vocabulary use and sentence structure.

Conversely, for most students, the computer's presence kept anticipation and energy high during steps in the writing process that typically become slow and mundane: editing and final draft. It is during this stage that students can become frustrated with their level of development with vocabulary, spelling and handwriting. In this project, while there was some of this same frustration during drafting and editing, we also observed students getting down to task and persistence so they would be chosen next to work at the computer.

Presenting with Technology

During presentation days, 4-6 students took turns reading their themes to classmates while the graphics were projected by the computer. During these "presentations" the students in the audience consistently maintained their focus on the projected computer graphics and rarely looked at the student reading. At the end of the presentations, students still working in editing were observed with a renewed interest in finishing their own themes.

In the final debrief, some students noted that they were anxious (and often excited) in anticipating sharing their themes to the class, but when the audience looked at the graphics instead of them, it made it much easier to present.

The technology's impact is apparent in students' final reaction to the writing workshop as expressed in the final debrief. Figure 3 reflects students' blind votes for their favorite step in this project, and it clearly shows a preference for the two steps that introduced technology.

Figure 3
STUDENTS' FAVORITE STEP OF THE WRITING PROJECT

Step	# Votes (Blind Voting)
Brainstorming	0
Webbing	0
Storyboarding	1
Editing	0
Final (Computer)	16
Presenting	7

Student Motivation and Esteem

Most affects to student motivation and esteem were observed during three of the writing steps: brainstorming, publishing, and presenting.

Brainstorming. During brainstorming, giddiness and anticipation that filled the room. Students were overheard sharing common sentiments about how the project was "fun" or "cool." On the first day observation, through lively, busy interaction, about half of the students determined a theme topic within 5-7 minutes; only six were still looking for a topic after 11 minutes; four after 15 minutes; and all had selected a topic within 18 minutes from receiving the clipart.

Publishing. As noted earlier, the time students spent sitting at the computer to develop the final draft was a source of motivation for many students. Students were observed laughing, interacting, and smiling during the time with the researcher at the computer. A significant event for many students occurred when they received the color printout of their themes at the end of this time. An example of one student's enthusiasm during this time was Brian (the visual organizer). Brian's time at the computer was interrupted by the bell for lunch. We had two more slides yet to enter. Brian requested that he be allowed to stay during lunch, or come back during recess, so that he could finish his theme and receive his printout.

Some students expressed feeling nervous or confused during the time leading up to sitting down with the computer. One student explained, "I was nervous. It was different having to work with someone else to do the final draft." By and large, however, comments were positive, "It was exciting." or "I thought it was funny watching (the researchers) move the pictures around."

At the end of this debrief, 17 students voted that they love to write; 6 that they liked it. None indicated that writing was OK or that they disliked it.

Discussion

This research represents an initial step in answering four questions as they relate to visual integration into an elementary creative writing process.

Will visuals in the story writing process have an effect on length and quality?

There is evidence that the integration of visuals into the process had positive affects on the length and quality of student compositions. The introduction of visuals during brainstorming facilitated students' ability to quickly choose a theme and begin the process of writing. Using visuals during webbing and rough draft provided a means for students to structure ideas, either through visual organization, sequencing, relationship or trial and error.

The majority of students' final themes reflected longer length, and greater risks taken with vocabulary, dialogue, and sentence structure.

Will visuals effect motivation or esteem?

Although students expressed some initial anxiety over their interaction with the technology, there seemed to be no lasting effects from this fear.

Motivation effects were observed during brainstorming, publishing and presenting. In addition, the anticipation to publish on the computer spurred many students to complete themes and remain on task. The pride students experienced with the color, visual printouts of their themes, and the ability to share both text and visuals with classmates, was deep and expressed openly. In their own words, students found this writing workshop "fun".

Will storyboarding impact student ability to organize?

The storyboards were a very useful tool for students in integrating text and visuals into student compositions. While the story web was observed as the primary tool supporting theme organization, the storyboard was useful in *maintaining* and *elaborating* on that organization through rough draft and editing.

Particularly for the Visual Organizer and the Visual Sequencer, the tool was excellent support for the grouping of ideas, a first step in helping students understand paragraphing. Even if classrooms are not equipped with computers or graphic software, introducing visuals and storyboards into the writing process as a tool for grouping ideas and paragraphing can be highly effective.

Student reaction to computers as a visual-text integration tool?

This research is indication that presentation software can be used as a educational tool to support visual and text integration with young children, and is not an exclusive software genre for supporting presentations in adults.

Computers can be seen as creative tools for children...not just a way to edit text or to conduct drill and practice. Similar to the benefits of Logo in the early 1980s for allowing children to direct and control the results on the computer screen, so can graphics programs and presentation software be seen as an avenue for student creativity and esteem.

Questions for further research and analysis....

While this research represents a step toward the study of integrating visuals and visual technologies into the elementary creative writing process, additional questions and further research is required. Specifically, do the four strategies described here for visual-text integration emerge consistently, or are there additional integration strategies that we did not observe?

Would the introduction of visuals/ technologies have similar impact on students of different ages and stages of writing development than our test group?

Conclusion

The writing workshop described in this study was a positive curriculum approach to integrating verbal and visual information into young student's development of writing skills. It was a project that provided rich observation, addressed specific questions regarding visuals and writing, and identified additional research needs. Most importantly, though, it provided the students involved with a lasting, professional-looking theme with color illustrations. For them it became more than a writing assignment, it became a source of creative pride, providing for them, in their words, "a keeper."

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Women in Cyberspace

by Linda E. Lucek

Introduction

We are all beginning to be deluged by references to the importance of the emerging (Inter)National Information Infrastructure, the Data Superhighway and the Internet. Yet many are still asking: "is there really much more there than that of superficial interest to most of us?" and "should we bother trying to find an on-ramp?" and even "is this really a positive development?"

Being a new public structure, and changing at warp-speed, cyberspace opens up many new dangers and ethical dilemmas, issues for which we have inadequate political frameworks in place. Neither a technomaniacal nor technophobic stance is adequate to prepare us for the possible consequences of cyberspace.

It has been said on more than one occasion that there are no women in cyberspace, referring both to literal numbers and to presence in terms of true representation. Although the early settlements in cyberspace have largely tended to be male-dominated, diversity does exist there. Women, men, boys, and girls of many cultures are the pioneers of cyberspace -- not a single, homogenous segment of the population.

A 1994-1995 survey of Internet users, conducted by The Online Research Group, a subsidiary of O'Reilly & Associates has their results posted online at: http://www.ora.com/survey/. The survey says that women comprise 34% of Internet users, a significantly higher percentage than previous estimates had projected.

More than half of all Internet users are between the ages of 18 and 34, and about half work for companies with more than 1,000 employees. The median household income falls in the $50,000-75,000 range. (Investor's Business Daily 28 Sep 95 A8)

What does it matter, in general, if there is diversity in cyberspace, and specifically, if there is a strong female presence in cyberspace? What difference will it make in the evolution of cyberspace? What difference will it make to women?

> How do women take hold of technology to create the world they want to live in? Although trapped in the mire of day-to-day survival, *women must direct time and attention to the creation of alternative visions of the future, or else they may be left out of it.*
> (Zimmerman, 1984)

Feminist Views of Technology

"In the spirit of encouraging futures other than those currently being sold to us", Carol Anne Stabile (1992) maps out the limitations of both technophobia and postmodern technomania in producing adequate "strategies for theorizing the grid, sprawl, hyperspace, or cyberspace known as postmodernity" on terrains ranging from feminist literary criticism to popular culture.

Feminist Technophobia

Stabile (1992) reflects on the technophobic historicity of recent feminist thought:

> The Vietnam War served to heighten the sense of technological disenfranchisement and hopelessness--television coverage of the war proved technoscience to be synonymous with the war machine and its destruction and devastation. The "second wave" of feminism, coming to age during the late sixties, inherited this sense of technological hopelessness . . . The trope of a technoscience equated with the war machine and a death drive also served to consolidate a feminist opposition equated with nature and life.

Feminist Technomania

The technological determinism of the seventies began to give way to postmodern theories in the eighties characterized by a systemic model, the cybernetics systems theory. Donna Haraway (1989) describes it as the "informatics of domination".

Marshall McLuhan saw that by mechanically extending our powers, modern technology is making cyborgs of us all. Donna Haraway hoped to illustrate through her *Cyborg Manifesto* (1989) that humanity has already evolved into creatures both human and technological (i.e., cyborgs) and that this is a wondrous, not wretched, path to take.

> The Cyborg Manifesto was written to find political direction in the 1980s in the face of the odd techno-organic, humanoid hybrids "we" seemed to have become worldwide. If feminists and allied cultural radicals are to have any chance to set the terms for the politics of technoscience, I believe we must transform the despised metaphors of both organic and technological vision to foreground specific positioning, multiple mediation, partial perspective, and therefore a possible allegory for antiracist feminist scientific and political knowledge. (Haraway, 1991)

Achieving a Balance: Thoughtful Engagement with Technology

Midway between the cyborg and ecofeminist positions is an alternative feminist ecological position (Alaimo, 1994), derived from cultural studies which emphasize intervention and poststructuralist Marxist theories, serving to "strengthen feminism's political impact while valuing nature."

Stabile notes several feminists (Evelyn Fox Keller, Sandra Hardy [sic, Harding], Helen Longino) who have encouraged a more productive peace with technoscience, a reconciliation, while at the same time steadfastly holding forth historical lessons of how technology has been used to oppress those who do not possess it or have access to it.

This constitutes an uneasy and wary alliance, constantly subject to examination and reevaluation. Unconditional peace risks losing sight of technology's characteristic proclivity toward abuse, leaving conditions ripe for repression (unintentional or otherwise) to reseed itself. Keep in mind that the *cyberhighway to hell* may be paved with good intentions. Cyberpunk science fiction has provided us with cautionary glimpses of what cyberspace could become.

Women in Cyberspace

Entrance Ramp: Proceed with Caution

Using the Information Superhighway analogy, we can ask both about the planners and construction workers developing the highway and also about those who are cruising it. How is "Rosie the Riveter" represented in cyberspace? Where do women drivers go when they cruise? What are the facilities, rest stops, and points of interest for women and where are they located?

At the same time we choose to explore this new cyberspace, we should listen to the travel advisories, the cautionary tales of highwaymen and con artists, neighborhoods to avoid and the diversionary and seductive allure of the open road. Just as Jack Kerouac inspired many a biker, the information highway also has its heroes. However, some are now posting hazard signs.

For example, Clifford Stoll, astronomer and computer jock, who wrote *The Cuckoo's Egg* (a best-selling, factual account of espionage, chase and capture on the Internet), has now come up with *Silicon Snake Oil: Second Thoughts on the Information Highway*. His new book (1995) outlines all the reasons *NOT* to get wired, emphasizing the benefits of *actual* reality over virtual reality and the loss in intimacy associated with overemphasis on electronic culture.

Dinty W. Moore's new book entitled *The Emperor's Virtual Clothes: The Naked Truth About Internet Culture* (1995) also cautions against taking Internet relationships too seriously:

> Trading e-mail is a sort of relationship, but it is not a full relationship -- not even close. I worry about a day when we all communicate this way, choosing our words maybe *too* carefully, just as carefully as choosing our natures and dispositions, our online names, and even our genders, based less on who we are than on what we wish to project.
> (Chronicle of Higher Education 6 Oct 95 A23)

Who are the women currently pioneering cyberspace? Some are educators. Some are scientists, engineers, computer scientists, *zine* (electronic magazines) reporters, artists, students, women's rights activists, advertisers, business representatives, politicians, philosophers, musicians, etc. -- just about any occupation imaginable. They come from many cultures with diverse cultural interests. Some might consider themselves "geeks" and others would not.

Some are representing academic institutions, religious affiliations, organizations, commercial interests, projects, or hobbies; others are representing themselves, subpersonalities, or misrepresenting themselves. This section contains a sampling of their activity, as reflected specifically on the World Wide Web portion of cyberspace.

Women's Resources Pages and Feminist Activist Resources

A number of sites on the Web attempt to provide comprehensive indexing of women's resource listings/links on the Internet or Web; some are specifically devoted to feminist activism and related issues (e.g., women and politics, women and career issues). There are also sites expressly concerned with legal resources for women, women's health issues and resources, reproduction and abortion rights, gay/lesbian/bisexual resources, child care, domestic violence, sexual harassment, and academic Women's Studies programs.

There is a great deal of overlap with such issues and many of the sites naturally link from one to another. Some, of course, oppose each other: such as "pro-choice" and "pro-life" sites. Some rather comprehensive listings are the work of individuals with great concern for an issue; some are the work of "official" organizations, committees, or research projects and it's not always apparent which is the case.

Neither is it always easy to determine from what sources the information has been derived. Presumably, some of it has been entirely made up. There is nothing to prevent such freedom of speech (*or* manufacture of "truth"). Responsible webmasters anticipate the need for source information and provide it in order to establish credibility for their sites.

Organizational and Professional Home Pages

The National Organization for Women (NOW) established and maintains their own Web site. It includes general information about the organization, organizational history, chapters and regions, national offices, membership information and contacts. In addition, they have their press statements and positions on various topics available online, issues of their monthly newsletter, links to other feminist resources, and an area in which to leave suggestions or comments. This is a fairly typical format for an organizational site.

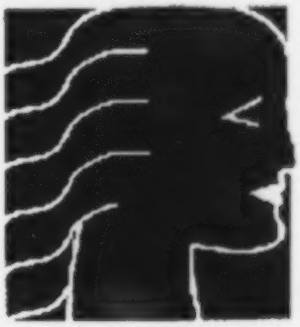
Examples of other organizational information available include: Women in Computer Science, Society of Women Engineers, Women of Color Caucus of the Society for Women in Philosophy, Lesbianas Latinas, University of Oregon Women Faculty Resource Network and on and on and on.

Several home pages exist for the League of Women Voters in different areas. For example the Ann Arbor, Michigan has a site at http://www.sils.umich.edu/Community/Students/lmcewen/lwvhome.html.

The *Voices of Women Home Page* (rated in the top 5% of all Web sites) provides a directory and professional listing of "woman-friendly, woman-owned, and woman-operated businesses". It can be found at http://www.voiceofwomen.com/.

Shown in Figure 1 below is the logo off the Home Page of the Small Business Association's Office of Women's Business Ownership. Their website is at http://www.sbaonline.sba.gov/womeninbusiness/.

Figure 1.



Conferences and Events Calendars

Often a part of an organizational site, but worthy of separate commentary, are the conference and event calendars available online. Having availability to information on events of interest a few clicks away can add enormously to cohesion and success of emerging ideologies. Awareness of what is being planned, discussed or acted on in one location, can add impetus to the progress of similar events elsewhere. Even after an event has ended, if the proceedings are made available online, the effects can continue to ripple through cyberspace. The UN's Fourth World Conference on Women in

Beijing, held September 4-15, 1995, had strong representation on the Web from a number of sites before, during, and after the conference.

> With Canada's financial help, feminists at the conference are setting up networks linking them together to track government action on women's rights and mobilize protests against any backsliding politicians trying to squirm out of the UN's plan to improve women's lives.
> (Toronto Star 13 Sep 95 A16).

This Canadian page offered general news, late breaking news, background information and more, in both French and English. It was updated daily during the conference and can still be found at http://www.iisd.ca/linkages/women.html

Shown in Figure 2 is the logo from the United Nations' Division of the Advancement of Women site at http://www.undp.org/fwcw/daw1.htm:

Figure 2.

The Institute for Global Communications (a division of the Tides Foundation nonprofit charitable organization) had their own Web page on the same conference with information on the non-governmental organizations (NGOs) who are part of WomensNet. The logo for their page is shown below in Figure 3.

Figure 3.

Beijing '95
Women, Power & Change

A typical example of a conference page is the one provided for the *Grace Hopper Celebration of Women in Computing*. It allows you to access general information on the conference, the conference schedule, registration form, or order a beautiful commemorative poster or t-shirt. All the program components including papers, social events, hotel reservation information and layout, transportation maps, round tables, birds-of-a-feather sessions, vender demonstrations are sometimes put together to form a complete online conference kiosk available before, during, and after the actual event.

Projects

Global networking technology has facilitated quite a number of projects designed to encourage women's participation in its evolution. A few examples will be mentioned here. *Virtual Sisterhood* is a global women's electronic support network, dedicated to increasing women's access to and effective use of electronic communications, founded by Barbara Ann O'Leary. Originating from the Women's Information and Documentation Center in Zagreb, and becoming an independent project within the feminist movement in the Yugoslav successor states, *Electronic Witches* has worked to provide communication technology and communication literacy to women globally.

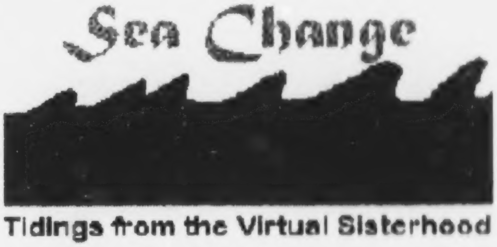
The Ada Project (TAP), named in honor of Ada Lovelace, was established out of Yale University in July 1994 as a central Web site through which resources for women in computing can be "tapped". It has been quite popular, recording over 2500 hits from more than 1700 machines in the first two months of operation. The hope is that the user community will help keep TAP up-to-date, by volunteering biographical profiles and Web links and through submission and feedback features on TAP pages.

Zines, Newsletters, Mailing Lists, Interactive Forums, and Subscription Services

"Free" and subscription-based electronic magazines are popping up all over cyberspace. Some have advertisers or sponsors, numerous journalists and technical staff; others are the part-time ventures of hobby enthusiasts.

The online newsletter for the Virtual Sisterhood support network is entitled *Sea Change.* It is located at http://www.igc.apc.org/vsister/initiat.html (logo shown in Figure 4 below).

Figure 4.


Sea Change
Tidings from the Virtual Sisterhood

Women'space (at http://www.softaid.net/cathy/vsister/w-space/womspce.html) is an online newsletter for and about women, based in Nova Scotia, Canada. It was "born out of a need to develop our understanding and our use of cyberspace as a powerful tool for women's activism.

The online daily newspaper, the *San Francisco Examiner,* has a regular section entitled the *San Francisco Examiner Women's Web,* similar to the women's section of numerous hardcopy newspapers. Time Warner's Pathfinder, which electronically publishes portions of *Time, People, Money,* and *Entertainment Weekly* often has articles targeted for women.

Spiderwoman is a mailing list dedicated to supporting women Web designers and there is a supporting Web site for it. *The Women's Page at the Social Cafe* at http://www.social.com/social/women.html sponsors an "interactive" discussion area for women's issues. Messages can be posted on any topic of concern to women and are available to be read and responded to by "thread" or subject.

Women's Wire runs both a subscription service and a free archive of some of it's information. An example of a "fringe" zine is *Geekgirl,* published out of Australia from an account called "spyfood" located on *Next Online,* whose opinions are not necessarily the same as those expressed within *Geekgirl.* A regular feature in *Geekgirl* is the Electronic Salon, a forum for presenting and promoting women's viewpoints and thoughts on technology. There appear to be only a couple of reporters, using cyberhandles (such as RosieX) who drum up electronic interviews with people like Sadie Plant, Noam Chomsky, and Spider Redgold on topics like cyberfeminism, *Tank Girl,* and cryptography.

Individual Home Pages and Virtual Clubs

Web Womyn, Geekgrrls, and Voxxen are all loosely-based groups of female Web crawlers and Web publishers. They find group identity *because* of the Web itself. This is one example of a type of cyberspace culture which does not exist independently of the medium. Virtual club members may find each other on the Web, perusing each others' home pages, and creating links to their new-found friends.

Conclusion

The Web is conducive to the easy formation of associations at many levels. While the Web's usefulness in advancing the goals of professional associations may be obvious, it has also proven to be home or spawning ground to numerous associations that might otherwise not exist at all. Often the members have never met in person; sometimes, the members may be so inspired that sooner or later they make it a goal to meet in person perhaps from around the globe.

Individuals who might never have opportunity to share "minority" thoughts or feelings with others of similar "culture" suddenly have global culture pool to draw from. For example, a teenager in a small town who comes into an awareness of lesbian identity may have no local lesbian culture to relate to. There is a strong gay/lesbian/bisexual presence on the Internet. (Examples include the *CyberQueer Lounge Women Home Page* at http://www.cyberzine.org /html/GLAIDS/Women/ womenpage.html and Queer Infoservers at http://server.berkeley.edu/queer/qis/ womens.html.) Individuals can retain their anonymity while they search for information or relationships on the Internet. If the teenager becomes a "modem grrl", she will have access to more gay culture than she may know how to handle.

The same is true for many other subcultures. Cyberspace is a hotbed for the formation of cultural identity. Radical activists are bound to find others of like thinking, even if there is no one around geographically for hundreds of miles who shares their ideology.

The same hold true however, for orchid horticulturists, game enthusiasts, transpersonal psychologists, or performance artists (etc., etc.). Rather than considering cyberspace to be a medium conducive to "destructive" elements of society, perhaps it would be helpful to think of the technology evolving as cyberspace more as a supercatalyst or leavening which speeds up or exponentializes all sorts of interactions.

Just as telephone systems and highway systems have made all sorts of transactions and cultural configurations possible, because of *increased* ease and speed of communication or transportation, cyberspace is another evolutionary step in this direction. If, as Donna Haraway believes, it is an inevitable step in the direction of cyborg nature, that does not mean the loss of all things "human".

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Appendix A: Other Web Resources for Women

Women's Resources - Academic
Univeristy of Oregon Women Faculty Resources Home Page
http://www.oregon.uoregon.edu

Women Homepage
http://www.mit.edu:8001/people/sorokin/women/index.html

Women and Technology
Women Undergrads in Computer Science
http://infomac1.science.uimelb.edu.au/cielle/women/wusc.html

Web-sters' Net-Work: Women in Info Technology
http://lucien.berkeley.edu/women_in_it.html

The Grace Hopper Celebration of Women in Computing
http://www.digital.com/pub/doc/hopper/info.html

Guides to Women's Health
The Barnard/Columbia Women's Handbook
gopher://dag.cc.columbia.edu:71/11/publications/women

News
Women's Wire
gopher://gopher.wwire.net:8001/11/.wwire

Feminist Science Fiction
WisCon -- Feminist Science Fiction Convention
http://www.ws.wisc.edu/wiscon/

Feminist Science Fiction bibliography
http://www.uic.edu/~lauramd/femsf.html

The James Tiptree, Jr. Award
(for the work of science fiction or fantasy published in one year which best explores or expands gender roles)
http://www.cs.wisc.edu/wiscon/tiptree.html

Minority Issues and Civil/Human Rights
Peacenet - Human rights organizations
http://www.igc.apc.org/igc/pn.html

The Creation and Varied Applications of Educational Holograms

by Jacqueline M. Layng

Introduction

Holograms are an exciting technology developed years ago but becoming increasingly popular today. Although most people have come in contact with a hologram, their potential has been left virtually untapped, particularly in the field of education. In order to understand the potential of holograms to the field, it is first important to understand the technology behind them as well as their present and future applications.

Hologram Technology

"A hologram is a photographic record of the interference pattern of two superimposed beams of coherent light, one directly from the source and the other reflected or scattered from a physical object" (Kasper & Feller, 1987, p. v). Dennis Gabor invented holography in the late 1940s and named it "hologram," which means whole record. In other words, a hologram is a three dimensional recorded image that is assembled in a very unique way. Although holography is similar to photography, the only equipment the two share is the use of emulsion to record images. The film required in holography is typically of higher resolution from, 2,500 to 5,000 lines per millimeter. This higher resolution is important to insure the quality of the image recorded.

There are two kinds of film, "the Agfa-Gevaert 8E75 HD NAH glass plate, which has an emulsion coating on one side of the glass, and flexible acetate-backed film" (Lovine, 1990, p. 45). The glass plate is more popular with holographers because it does not bend or require special attention to keep the film rigidly in place as needed with plastic film. The other tools that make a holographic image possible are lasers, optical mounts, mirrors, lenses, beamsplitters and an isolation table.

Lasers

There are many different types of lasers, but the helium neon (HeNe) laser that produces a red beam has been the main one used in holography. It is the color of the laser that determines the emulsion used for recording. In recent years different types of lasers such as "rainbow" and others have been utilized to create various kinds of holograms. The importance of the laser to holography cannot be overstated because, in order to create a holographic image, coherent light must be utilized. Coherent light is a synchronized pure source of energy that has the precision required to record holographic images. It is for this reason a hologram cannot be created through ordinary light like a photograph.

> "Individual units of light from the object and from the reference light meet, and in varying degrees, interact positively and negatively. Where they meet more negatively, little or no light is recorded, and where they meet more positively, light is recorded in the holographic film" (Lloyd, 1993, p. 378).

This is how a hologram is recorded and why the laser is such an integral part of the entire process.

There are five different classifications of lasers that are accessible to human beings during normal operation used in holography (Lovine, 1990, p. 29). Class I lasers cannot under normal conditions emit any hazardous levels of light and are ½ millwatt or less in power. Class II lasers do not exceed one milliwatt of output power but can cause retinal damage if one stares into the beam for a long period. Class IIIA lasers contain output power between one to five milliwatts. Most HeNe lasers are produced in this class. Class IIIB has an output power between five to five hundred milliwatts and must not exceed five hundred milliwatts. This laser can produce accidental injury if viewed directly. Class IV exceeds power limits of Class IIIB and produces a hazardous direct or reflected beam (Unterseher, Hansen & Schlesinger, 1982, p. 100).

Optical Components

Optical components or lenses and beam splitters are also imperative to the creation of holographic images. "The key purpose of the lens in holography is to spread the laser beam" (Lovine, 1990. p. 31). This is accomplished through the use of positive and negative lenses which split the laser beam in different ways. Mirrors are also used to redirect light on the table to correctly capture the image. Beam splitters divide the beam of light into two well-defined beams and consist of a piece of glass with parallel faces. These beams are the reference and reflected light that create the recorded image or hologram.

The most commonly used mirrors are flat or plane mirrors, that are a must in holography, to redirect the reference and object beams several times between laser and film (Heckman, 1986, p. 202). Although holography has been called "lensless photography," lenses do serve an important purpose in the holographic process.

> "An unspread laser beam is far too narrow to illuminate anything but the smallest objects. The most useful lens is a simple diverging one similar to the end piece of a microscope. This widens the object beam so its light reaches the whole viable surface of the subject to be holographed" (Heckman, 1986, p. 203).

The third optical mount that makes holography possible is the beamsplitter, which divides the laser into the reference and object beams. A beamsplitter allows a holographer to divide laser light into many different intensities which ensures that the interference between object and reference waves is properly recorded into the emulsion (Heckman, 1986, p. 203).

The final and fourth type of optical mount required to record a hologram is the film plate holder which does just what its name claims, securely holds the film in place. Therefore, lenses widen the laser beam while the mirrors redirect it and the beamsplitters divide it, weakening or strengthening the reference as well as object beams to capture the three-dimensional image on the emulsion held in place by the film plate holder.

Isolation Table

The final piece of equipment required to record three-dimensional images is an isolation table.

> "Stability is essential to producing holograms. The isolation table stabilizes the components placed on it and isolates them from vibration. Since the surface of the isolation table supports all of the components and subject, the impact of vibration cannot be overemphasized. Vibration so slight that is imperceivable to our senses can prevent the hologram from forming clearly." (Lovine, 1990. p. 17).

It is evident that noise or any interference will hinder producing a viable image. The environment must be pure and the conditions near perfection to create a high quality hologram. The table must be placed correctly and a interferometer (measurement instrument) utilized to graphically display any vibration in the area or on the table.

Recording Process

The entire recording procedure must take place in a near totally dark room for the image to form on the emulsion. The amount of time an object is exposed in holography is determined by a light meter just as in regular photography, except the exposure charts reflect the individual medium's optimum exposure environment. The table is set up in a specific way to record an image and this setup varies with the kind of laser beam utilized.

For example, a one-beam transmission hologram shoots the laser through a lens which also serves as a beamsplitter sending the beam to a mirror and to the object. These beams bounce off the object and mirror toward the film plate recording the image through the interference between the two beams (Kasper & Feller, 1985, p. 106). There are various other items that are used to direct the beams or limit the amount of light falling in any one area that are called filters and cards.

A two-beam transmission hologram is similar to a one-beam transmission but utilizes a beamsplitter to divide the beam before entering the lenses, sending one beam directly through one lens to a mirror then off the film plate and a second beam to a mirror which reflects it through another lens off the object to the film plate. There are other methods, such as one-beam and two-beam reflection, that utilize several beamsplitters and/or mirrors to redirect the reference and object beams to record from two different directions. "With reflection holography, a laser beam is spread evenly onto a piece of holographic film with a concave diverging lens" (Schlegel, 1986, p. 23). There are multiple set ups using the various optical mounts to create different holograms. Nonetheless, when a hologram is recorded, information about the object is stored everywhere on the film plate (Unterseher, Hansen & Schlesinger, 1982, p. 356).

Film Processing

If this equipment is utilized correctly an image will have been recorded on the emulsion, but the process to create a hologram will have been only partially completed. The film must be developed and properly illuminated to produce a holographic object. There are basically four chemicals required to develop transmission and reflection holograms. These are: pyrogallic acid, sodium carbonate, potassium dichromate and sulfuric acid (concentrated). The process of developing is very similar to that of photography. The film plate is put through several chemical washes and dried.

The washes consist of a developer, stop bath, fixer, hypo-clear, photo flo and bleach which is used to improve the diffraction efficiency of the hologram (Unterseher, Hansen & Schlesinger, 1982, p. 56). The amount of time the emulsion should be washed in each bath varies due to the type of emulsion and the kind of transmission utilized when recording the object. The general process for single/split beam holography is, "develop - D19 for 15% dark by eye, stop for one minute, fix for three to five minutes, rinse three to five minutes, hypo clear two to five minutes, rinse two to five minutes, bleach until pink, rinse two to five minutes, photo flo briefly and squeegee" (Unterseher, Hansen & Schlesinger, 1982, p. 140). It is important to remember that the emulsion must be completely dried before illuminating the film plate.

Illuminating the Image

It is imperative that the film plate be correctly illuminated to produce a three dimensional image. There are two types of illumination and each hologram requires its own type. White light reflection is viewable in white light and it is best to illuminate this hologram with a point light source such as the sun. "Reflection holograms work something like a mirror, so the hologram is viewed from the same side as the light" (Lovine, 1990, p. 77). Transmission holograms need a monochromatic light or laser for viewing. In this type of hologram, the light must pass through the film, so observation takes place on the opposite side of the light source. "To produce the holographic image, all you have to do is to process the hologram and then place it back in the original reference beam" (Saxby, 1988, p. 42). It is in utilizing a replica of the reference beam to illuminate the film plate that a virtual image of the object is created occupying the precise space of the original object. Hence, the process used in recording the image is somewhat duplicated in the process of displaying the image.

Hologram Market

The holography, which is complicated and at times confusing, is being replicated continually all over the world. Holograms have proven to be quite useful in society and have found a "home" in the market place. Currently, holograms can be found on food boxes, magazine tip-ins, credit cards, magazine covers, labels (for security reasons), book covers, tickets and currency. They appear to sell products at a faster pace and reduce fraud by making it difficult to reproduce illegal credit cards and currency (Kluepfel & Ross, 1991, p. 7).

The majority of holograms are called rainbow holograms, and "have been made easily printable via embossing the images on plastic" (Brand, 1988, p. 84). However, the hologram image is still difficult to duplicate for fraudulent purposes. The original uses of holograms fell in the area of the arts and has only recently branched out into the commercial market. The applications of this incredible tool appear to be limitless and as new ground is being broken the opportunities for other fields working with this tool are also increasing.

Hologram Applications

Three general applications of holography have emerged since the mid-1960s. These fields are: "display holography (popular commercial and fine art images), holographic non-destructive testing of materials (technology of holometry) and holographic optical elements (Museum of Holography)" (Lloyd, 1993, p. 377). A fourth application of educational holography is currently evolving utilizing the hologram's ability to take three-dimensional ways of thinking to another dimension of presentation, representation and conceptualization. "Until two decades ago, holography was strictly the domain of research scientists working in heavily funded research and development programs" (Sanders, 1993, p. 7). Now, two broad areas of significance in the fourth application of holography are the expanding educational roles and exploring holography conceptually to restructure critical assumptions within as well as between the disciplines of the arts and sciences. In discussing the varied applications of holography this paper will first focus on the general applications which aid learning and knowledge acquisition and then look at the direct uses of this technology in the field of education.

Holography has helped advance the arts through the study of visual design and has made a difference in how scientists gather information about changes in materials and products. Museums use holograms to make exact three dimensional recordings of priceless antiques, fine art and rare archeological specimens too fragile for public display, while, manufacturers in the air and space industry use holographic non-destructive testing (interferometry) to make extremely precise measurements not possible by other means. For example, "An airplane structure can be recorded before and after flight in order to find abnormal deformations indicating areas at which there is a risk of future failures" (Abramson, 1981, p. 324).

New and innovative developments in the field of holography that have been and are affecting the field of education include: holographic elements used in super market bar code scanners, holographic computer data storage, X-ray holography, microscopy, television and advanced biomedical as well as topographical imaging techniques. Bar code scanners have been adopted all over the world, and laser scanners have come to be used in various situations, such as libraries.

Computer data storage has recently been developed, "a holographic device that could store 1,000 times more data than today's computers and retrieve the data 100 to 1,000 times faster" (Rockford Register Star, August 30, 1994, p. 4A). Holography is many different things,

> "the ability of artists to be sculptors of light, allowing scientists to be students of "transholography" which addresses elusive, complex issues involving time-reversal and possibly allowing the contents of the Library of Congress to be holographically recorded into a volume that will fit on a spoon" (Lloyd, 1993, p. 384).

It is difficult to believe such things are possible but they are being developed. The field of holography has moved beyond the fields of art and science to include the fields of business and education. For example, "Researchers at Stanford University have demonstrated a prototype storage device that uses holographic technology to store computer data. The device would allow massive amounts of data to be stored in an area the size of two sugar cubes" (Rockford Register Star, August 30, 1994, p.4A). This development will most likely have great effects on the field of artificial intelligence, telecommunication, and virtual reality. The increased storage should expand the development of speed and accuracy in delivering telecommunications and virtual reality. Imagine transporting large graphics over the Internet in a fraction of the time it takes today. These improvements aided by holography could be the answer to the power and space requirements needed to optimally develop artificial intelligence. Computers that act and react as humans without constant assistance from humans and with the ability to process information fully may well be possible through the use of holographic technology.

These are the high-end users of holography, which are utilizing this tool to increase knowledge and improve society. The field of science invented holography and has been the most consistent developer of the tool. Holography has been an important tool in the research of matter and, with every new innovation, the hologram becomes a more valuable instrument of science. Art has also benefitted from working with holograms by uncovering detailed information on light and using this information in other areas to increase creativity as well as knowledge. Education has been a part of the development of holography and there is a strong need to apply the technology to education.

The educational applications for formal and informal environments have just begun to be tapped and the future appears to be a vast and open field of opportunities. Holograms can be used to inform students, "in ways print and electronic media can never comparably approach (precise size replication of objects in length, width, depth with parallax, and options for demonstrating motion)" (Lloyd, 1993, p. 377). There are also the practical uses of holograms to aid students in conceptualizing whole objects that could not be experienced first hand.

Mass-produced holograms have proven to be of great interest and have sold millions of magazines as well as other products. The most viable and widely produced holograms have been embossed on plastic or silver stickers. These holograms are inexpensive and have an ability to motivate people's interest in various subjects (Kluepfel & Ross, 1991, p. 64). Although not all the holograms are of high quality, there is a potential for putting these same holograms to work positively in education.

A teacher utilizing these holograms could stimulate interest in science and explaining the procedure in hologram development can still yield exciting results. The simple discussion of what makes a hologram would raise multiple questions on this subject and more. Most students are curious to know how and why things work, especially if they appear high tech. (Lloyd, 1993, p. 382). Students making their own holograms can produce a wide variety of investigations on lighting, the color of objects and the commonalities between the arts and the sciences. According to R. Scott Lloyd, "Several schools are taking advantage of learning from existing, mass produced holograms and are making their own in the classroom. This is where the discovery in the arts and sciences can truly soar" (1993, p. 382).

As society continues to move forward in the "age of information", more and more information is being visually gleaned from the world. It is becoming imperative that education aid learning through an interactive environment using various technologies. Holography has been and is continuing to be an important technological tool in the field of education. Microscopic holography allows the student of science to record an object in a short amount of time and "transient objects can be examined at leisure and in full three dimensions" (Caulfield, 1970, p. 123).

Furthermore, the present use of holograms in the field of medicine is giving students the ability to work on holographic organs before cutting into actual bodies (Brand, 1988, p. 90). A perfect example of virtual reality in action is Snapshot X-ray holography. It displays particular promise for a safer and more effective X-ray by allowing doctors as well as medical students to focus on particular areas of the body with complete three-dimensional information (Solem & Baldwin, 1982, p. 229). These are present uses in the field of medical education and actual proof of how holography is merging with other technologies such as virtual reality. The future holds great promise for these types of applications in other areas of education.

According to Ronald Schlegel in 1986 "A GTE laboratory developed a room size prototype holographic television and in the not-to-distant future a full color-holographic television should be available on the market" (p. 24). This would be the merging of artificial intelligence, virtual reality and holography to create a full-sized virtual environment that processes information like humans. Basically, it will be Star Trek: The Next Generation's holodeck incarnate. Imagine a classroom that brings the civil war to life with the students actively participating as key historical figures. The artificial intelligence would be the brain of the entire operation, storing, retrieving, and creating an infinite number of scenarios for the participants. Virtual reality would be the scenarios come to life using holographic images to create a three-dimensional environment which interacts with the participants. Each technology would interact with one another to create this environment, an environment that could exist without all three technological components. All of these various applications play a role in the field of education.

Holograms have opened up a whole new frontier for humans to strive to understand and control. This technology gives artists and scientists a special tool to aid them in understanding the world. Several positive applications have been discussed and the area is still relatively untouched. The future holds the most important key to the field of holography. Imagine using a holophone that sends three dimensional images of people into homes so they can share information. Holograms could be used to adorn drab office blocks and industrial estates; they could be used to provide panoramic views of exotic locations in air terminals and restaurants or a hologram of a police car could be planted near a busy street to slow down traffic (Wenyon, 1985, p. 131). All of these applications would require the aid of other technologies such as telecommunications, artificial intelligence and virtual reality. Perhaps, these holograms will be transported over phone lines by a computer utilizing artificial intelligence to create these various virtual environments.

There are several future challenges to using holography in education. The field has a consistent problem with increasing the size of holograms and maintaining a quality image. True color has also been an elusive element that developers need to control to evolve towards "real life" holograms. Although moving holograms do exist, there is a need to work on increasing the series of movements as well as the ability to transmit quality images over other media. Here artificial intelligence could prove to be the greatest help to holography by allowing the computer to solve these human limitations. Holograms do have certain limitations at this time, but, as researchers continue to work on solving the problems, it becomes apparent that holograms are here to stay.

In fact, some of the most useful discoveries in the field have come through collaborations between two or more technologies such as the laser in the holographic process and recently the development of computer holograms. This particular area appears to have been drawing a great deal of attention. One example of a computer hologram is "medical imaging".

> "X-ray-like data from CAT scanners and MRI machines are assembled in 3D images of the body. Instead of a slice at a time you get a whole transparent body. You peer into a person's abdomen, peeking around a bone or an organ for an anomaly" (Brand, 1988, p. 90).

Positive outcomes through the use of computer holograms are another area just beginning to be analyzed. Overall, the hologram seems to be quite a technological advancement for society. As Schlegel states, "Holography and the laser truly have unlimited potential" (1986, p. 24). This technology continues to affect a multitude of fields, in particular telecommunications, artificial intelligence, virtual reality and computers.

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Visual Links in the World-Wide Web: The Uses and Limitations of Image Maps

John J. Cochenour, Jung Lee, and Robert D. Wilkins

Introduction

The recent evolution of information delivery systems on the Internet into World Wide Web "browsers" like Netscape or Mosaic presents an exciting field for study in visual literacy. Such tools are rapidly becoming a major interest to small and large business concerns (Ellsworth, 1995) and may soon impact the nature of education in profound ways (Perelman, 1992). Understanding the visual characteristics of the image map, a key element in these new graphical interfaces to the Internet, is critical to the design of effective information display and access tools.

This study investigates the evaluations of different image maps selected from current home pages of educational institutions on the World Wide Web. Independent viewers and a survey form using criteria relating to visual literacy and hypermedia design were used to investigate the effectiveness of these image maps. This paper discusses research results relative to visual, navigational, and practical characteristics.

Literature Review

World Wide Web

As recently as the middle of 1993, the delivery of hypermedia modules over computer networks was problematic. A mechanism was needed that would standardize structural principles for the delivery of such modules and that would be "within the economic reach of ordinary users" (Howard, 1993). By the middle of 1994, exactly such a mechanism, the World Wide Web, had become available. Now, the full spectrum of communication tools is available electronically. Today many resources of hypermedia—integrated text, graphics, audio, animation, and video—are accessible across the World Wide Web (WWW).

The WWW is the fastest growing information tool on the Internet (Descy, 1994). Along with the rich multimedia communications, graphical web browsers also provide a very high level of interaction. Users can quickly jump to new, related information using interactive linking tools like "buttons," "hot words," or "image maps." These hyperlinks can connect users to new information resources on their own campus, within their own towns, or around the world with the simple click of a mouse button (Dougherty & Koman, 1994).

Image Maps

Graphics may be used to capture a viewer's attention, to hold interest (Grabinger, 1993), to supplement and reinforce textual materials (Lucas, 1991) or to provide organizational overviews of complex data (Grabinger, 1993), (Koneman & Jonassen, 1994). Likewise, in web browsers, graphics may just add visual interest, mark a simple link to related information, or indicate organized multiple links to a complex information set. In the WWW, these links are called hyperlinks.

Figure 1
Simple Graphic Links to Single Data Sets.
(http://vinny.csd.mu.edu/~howard/monet.html)

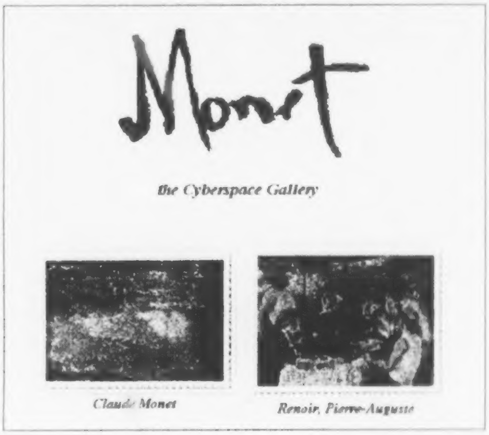
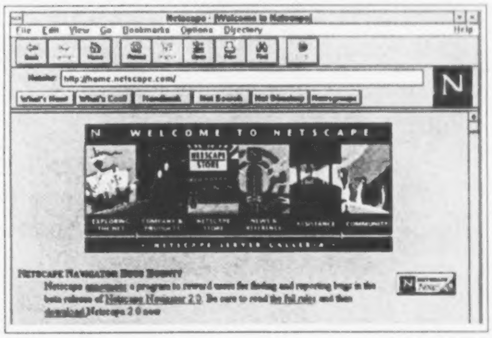

Monet
The Cyberspace Gallery
Claude Monet
Renoir, Pierre-Auguste

Figure 2
Multiple Links from One Image Map to Several Data Sets.
(http://home.netscape.com/)


File Edit View Go Bookmarks Options Directory Help
http://home.netscape.com/
N
WELCOME TO NETSCAPE
EXPLORING THE NET
COMPANY & PRODUCTS
NETSCAPE STORE
NEWS & REFERENCE
ASSISTANCE
COMMUNITY

A hyperlink is the connection between a word or graphic in an active browser view to another file *anywhere* on the World Wide Web (Hudak-David, 1994). A simple graphic hyperlink connects a single image to a single information resource (Figure 1). The *image map* (Figure 2) provides easy multiple choice access for web users. An image map connects a single, complex visual by multiple hyperlinks to a number of related information resources (www@trace.wisc.edu; Wiggins, 1994). A web browser recognizes when a user clicks a displayed "hot word" or "hot spot" and simply opens a connection to the pre-programmed uniform resource locator (URL - the Internet address of the desired resource). Currently, the image map is the most refined expression of this integration.

Image Map Design Issues

Effective image maps require careful design with respect to visual and interactive aspects as they pertain to the users. User interface design for image maps touches on three broad areas: visual characteristics, navigational characteristics, and practical characteristics.

Visual Characteristics

Visually, it is important that an image map be easily recognized as an image map. There should be visual cues that tell users they are dealing with an image map. The visual content presented in an image map should also support a typical viewer's expectations relative to the information the graphic is supposed to represent (Lucas, 1991). For example, an image map for a university in Arizona would probably not be designed around an arctic theme.

The individual graphics and related "hot spots" within an image map should represent the natures of the key informational segments. For instance, a book icon is a good representation for library services. Hot spots within an image map should be easy to recognize (Lucas, 1991; Jones, 1995). Often, a change in the mouse cursor will cue the presence of hot spots. In other cases, maps or similar structural features suggest the possibilities of hot spots. An image map should be artistic and visually appealing but not too busy or cluttered (Lucas, 1991; Jones, 1995; Grabinger, 1993).

Navigational Characteristics

Navigation is the act of recognizing and initiating a hyperlink to new information. Navigational aids should, if desired by the viewer, permit returning to the starting point in order to investigate other possibilities. Back tracking and book marking are additional navigational aids to help clarify the structure of multiple paths and provide quick repeated accesses to pertinent information (Desberg, 1994; Jones, 1995). Image maps should help users build mental models of the underlying structure and inter-relationships of information resources (Lucas, 1991).

Navigational pit falls such as dead ends, endless choices, or links to non-existent resources should be avoided. Links to non-existent resources are troublesome given how frequently web pages change. Finally, "help" should be available on demand or when "non-hot-spot" areas of an image map are clicked (Desberg, 1994).

Practical Characteristics

Practical concerns consider the implementation or working characteristics of image maps. An image map graphic should not take too long to load (Desberg, 1994) and the special effects (image overlay, fades, fonts, extraneous visual information, colors, 3D, animations, video, backgrounds) should not clutter the display or frustrate the viewer (Desberg, 1994). It should be easy to tell what resources have been visited in the current session with the image map (Jones, 1995). A visual consistency (Grabinger, 1993) should tie the image map and its related information resources together, cueing the viewer that he or she has not branched off into unknown or unexpected territories (Lucas, 1991). The graphics and the related information resources should fit the target audience (Desberg, 1994).

Methodology

Development of Survey Questionnaire

Since there is no previous research about image maps, this research represents a pilot study directed toward developing an evaluation procedure. Starting with guidelines from several computer-related product checklists in the literature (Lucas, 1991; Desberg, 1994; Cates, 1992; Tolhurst, 1992), the authors developed a 20 question survey form addressing design issues based on visual, navigational, and practical characteristics. Two initial surveys, conducted as a pilot for formative evaluation, determined changes and clarifications needed in the questionnaire. Following the pilot, the scale of evaluation was changed from 1-4 (strongly disagree to strongly agree) to 1-10 (ten step scale from disagree to agree) in order to clarify and strengthen the differences in viewer opinions.

Initially, questions were stated so that a high numeric response indicated strong agreement. However, some questions became awkward to read in this format. For example, one question stated "I was not frustrated by the image map." The authors were concerned the question could be confusing because of the non-typical negative structure so a few questions were re-phrased on the survey form. This sample question was re-written "I was frustrated by the image map." In this format, a response of 1 suggests a good image map.

Of the twenty questions, eight questions covered visual characteristics. For example, the questions ask how easy the graphic is to recognize as an image map, how noticeable the hot spots are, or how appealing is the image map. The navigational aspects, using seven questions, ask how easy it is to move from page to page, how easy it is to return to the starting point, or if help is available. Five questions cover the practical concerns such as how long graphics take to load, how consistent the graphics are at a particular site, or if the image maps are frustrating.

Selection of WWW Sites

The evaluation scope was limited to educational or institutional home pages on the WWW. The Net Directory option of the web browser Netscape 2.0 was the sampling source using the category of education. Two sites from each of 36 sub-categories of the educational area were randomly selected by the authors. While examining the 72 site options, the authors selected image maps that covered the spectrum from difficult to facilitative for typical users. Nine sites, (Figures 3 through 11) representing visual, navigational, and practical image map characteristics, were selected for the final evaluation by independent viewers.

Independent Viewers

Nine viewers were involved in this survey. Most of them are education graduate students taking instructional technology classes. Others were volunteers. They individually came to a computer station connected to the Internet and spent about one hour evaluating the image maps. Addresses of the nine sites and the survey form were given to the viewers and they usually decided which sites to evaluate out of the nine possibilities. Viewers' activities were observed by the authors during their evaluation time. Only two viewers finished evaluating all nine sites within an hour while one individual spent an hour and a half. Most of them evaluated four or five sites within an hour. Those who finished all nine sites within an hour were already familiar with the World Wide Web and image maps. Most viewers were quite new to the WWW and spent the first ten to fifteen minutes exploring. Those who were unfamiliar with the WWW were given some advice while exploring the image maps.

Results and Conclusions

Fifty-five surveys were collected from nine viewers. Each site was evaluated four to seven times by different viewers. For analysis, every question item has the same value system: the higher the score,

Figure 3
Discovery Channel Image Map.
(http://www.discovery.com/DCO/doc/1012/online.html)

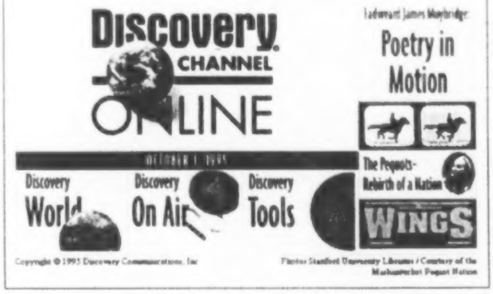


Figure 4
Educom Image Map.
(http://www.educom.edu/)

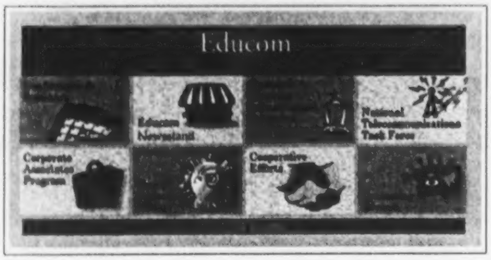

Educom
Educom Newsstand
National Telecommunications Task Force
Corporate Associates Program
Cooperative Efforts

Figure 5
Excite Image Map.
(http://oberon.educ.sfu.ca:80/newhome.htm)

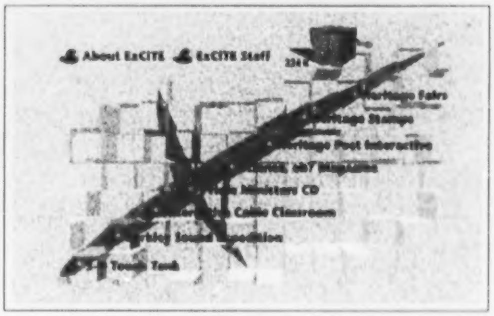

About ExCITE
ExCITE Staff
Heritage Fairs
Heritage Stamps
Heritage Post Interactive
Miniature CD
Cable Classroom
Sound Expedition
Touch Tank

Figure 6
Paris Museums Image Map
(http://meteora.uscd.edu/~norman/paris/Maps/MM)

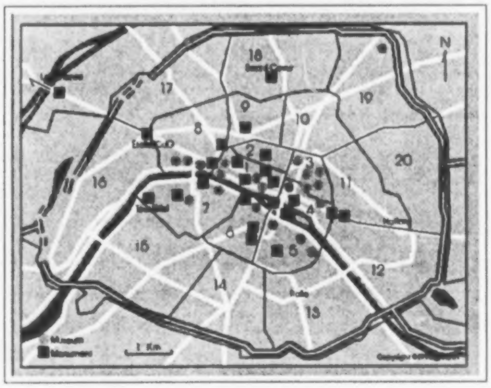

N
18
17
19
9
10
8
2
3
20
16
11
7
4
6
15
5
12
14
13
Museum
Monument
1 Km

Figure 7
QuickTime Image Map.
(http://qtvr3.quicktime.apple.com/)

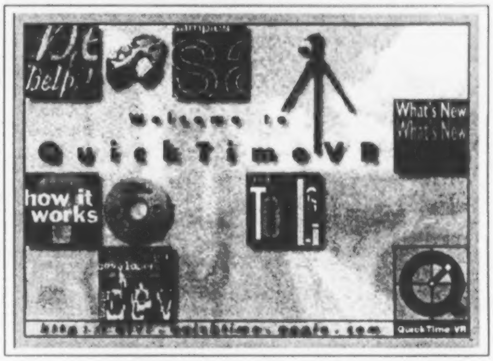

help
Welcome to
QuickTimeVR
What's New
how it works
dev
QuickTime VR

Figure 8
Texas A&M University Image Map.
(http://www.tamu.edu/test/map/map.cgi)

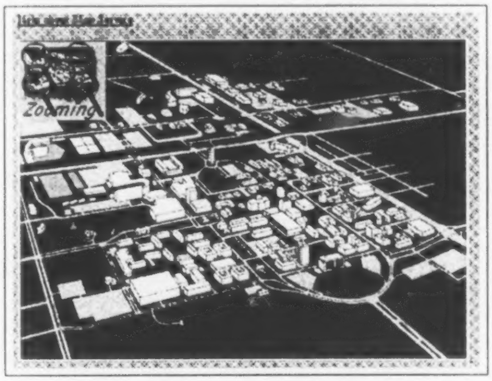
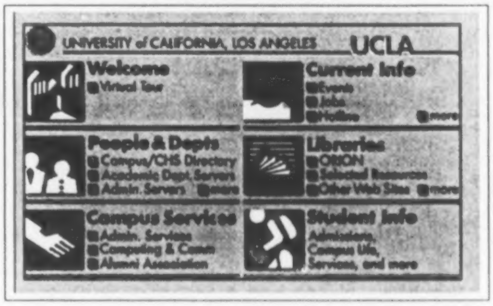
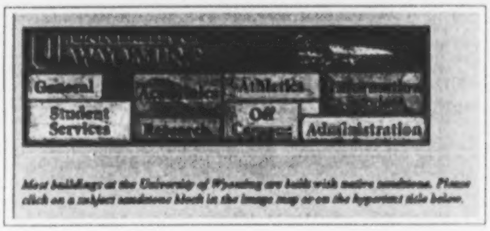


Figure 9
UCLA Image Map.
(http://www.ucla.edu/)


UNIVERSITY of CALIFORNIA, LOS ANGELES
UCLA
Welcome
Virtual Tour
Current Info
Events
Jobs
Hotline
more
People & Depts
Campus/CHS Directory
Academic Dept. Servers
Admin. Servers
more
Libraries
ORION
Selected Resources
Other Web Sites
more
Campus Services
Admin. Services
Computing & Comm
Alumni Association
Student Info
Admissions,
Campus Life,
Services, and more

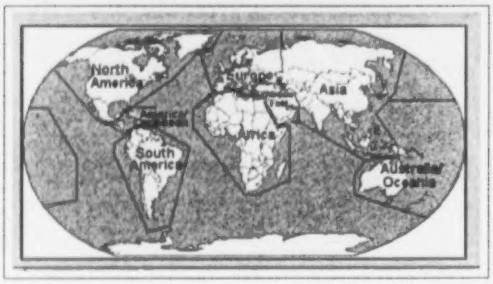
BEST COPY AVAILABLE

Figure 10
University of Wyoming Image Map.
(http://www.uwyo.edu/)



Most buildings at the University of Wyoming are built with native sandstone. Please click on a subject sandstone block in the image map or on the hypertext title below.

Figure 11
Virtual Tourist Image Map.
(http://wings.buffalo.edu/world)



the more positive the map characteristic. The 20 survey items were grouped into three categories: visual, navigational, and practical. Because each category reflects a different number of questions and a different number of viewer evaluations, the total score of each category was divided by the number of questions times the number of viewers in order to give a comparable weight to each category. Figure 12 shows the analysis of the data.

Overall Rankings

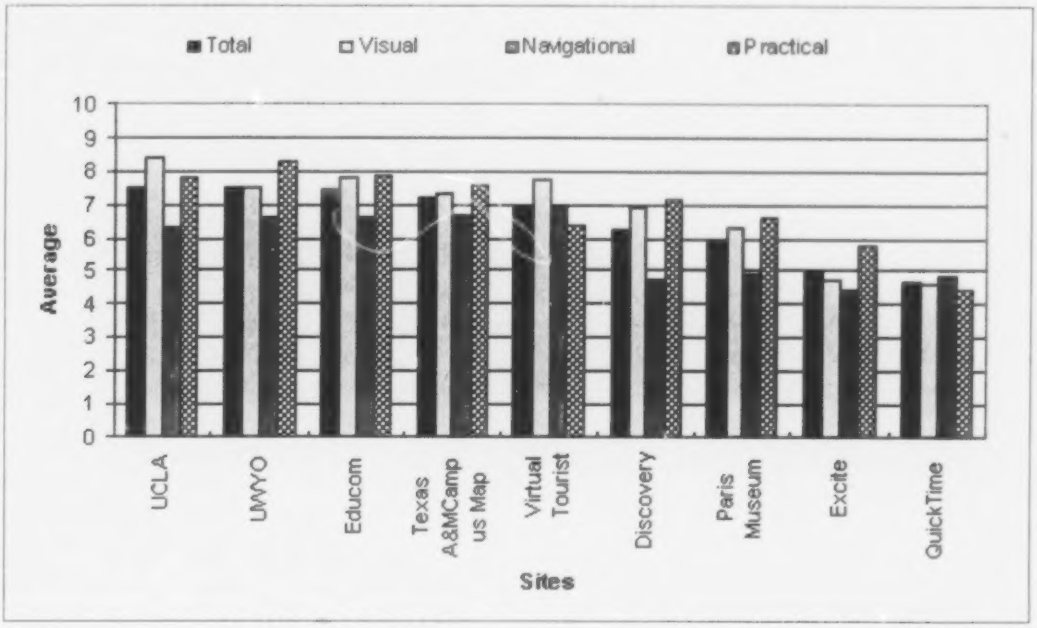
Overall, the image maps of UCLA (Figure 9) and Educom (Figure 4) were selected as the best. In visual characteristics, UCLA and Educom also claim the top two rankings. From a navigational perspective, the Virtual Tourist (Figure 11), the Texas A&M campus map (Figure 8), and the Educom image map occupy the top three spots in a very close ranking. Finally, from a practical viewpoint, UW (Figure 10) has the highest ranking. The UW result is supported by an independent study of nearly 500 college web pages conducted at Columbia University, which also considered visual and practical characteristics (Johnson, et. al., 1995). Their study highly rated the UW web page for good presentation of general information.

Visual Perspective

There seems to be two conflicting elements at work in the visual analysis. Image maps can be very artistic and complex or rather simple. When viewers are looking for direction to information, they appear to prefer simple image maps. Even when viewers were asked how visually appealing a graphic was, they seemed to judge the degree of appeal by how easily they could get to information. If they could quickly locate hot spots in the image map and if the icons accurately represented the information, they seemed to prefer the graphic. The UCLA (Figure 9) and Educom (Figure 4) image maps, which ranked the highest, both use a simple and well-grouped layout.

In Grabinger's study (1993), simplicity is one of the important factors in computer screen design. Besides simplicity, Lucas (1991), in a study about effective computer-learner interfaces, states that grouping has a very strong influence on commanding and focusing viewer attention. As counterexamples, Quicktime (Figure 17), Excite (Figure 5), and Discovery (Figure 3) present more artistically interesting image maps. However, these three all violate the rules of simplicity and united grouping. For instance, the Quicktime image map scatters

Figure 12
Comparison of Average Viewer Ratings by Site: Overall, Visual, Navigational, and Practical.



hot spots all around the graphic which defocuses or scatters viewers' attention and results in the lowest visual ranking. The Discovery and Excite image maps appear to override marginal grouping with a too complex image.

Navigational Perspective

Navigation deals with the mechanics of moving through the available information. Regarding navigational aspects, the Virtual Tourist (Figure 11), Texas A&M campus (Figure 8), and Educom (Figure 4) image maps were selected the best. These sites do not give the viewers many layers of choices. Thus, it is easy to link out in a single step and quickly return to the starting point. The high ratings for the Virtual Tourist and Texas A&M image maps may also be a function of the physical nature of the information they represent. Grabinger (1991) suggests that viewers prefer screens designed to closely reflect the content of the subject matter.

Practical Perspective

As to practical aspects, UW (Figure 10), Educom (Figure 4), and UCLA (Figure 9) ranked highest. Typically, these image maps are smaller and load quickly. Special effects are minimal. Consistency is a strong characteristic of these image maps and their related information pages. The linking pages have visual cues such as icons or graphics very similar to the original image map. These maps were also highly rated in visual criteria, suggesting practical characteristics may be correlated with visual characteristics. Artistic images, such as the Discovery or QuickTime image maps (Figure 3, Figure 7), tend to be large, complex and slow to load.

Discussion and Recommendations

This pilot study presents a number of factors that appear to be important to effective image map design when a viewer's purpose is to locate specific information. In this instance, functionality is the most important aspect. Simple graphics that load quickly and clearly designate hot spots appear to be preferred by the viewers in this study. Viewers, particularly novices, also wanted some site-specific help available when navigating web sites. Figure 13 presents the authors' recommendations as a "quick" guide for designing effective image maps for informational purposes. The Educom (Figure 4) image map, which placed somewhere in the top three rankings in each category, is the best example of these recommendations.

There may be different design guidelines when entertainment is the purpose of the image map. There is an interesting tension between artistic and functional aspects of image map design. A web designer must consider the balance between the purposes served by the maps and the intentions of the prospective viewers. From this research, viewers seeking information want functional, simple maps but viewers "surfing the web" may pass over such simple maps for the more artistic and entertaining images. The challenge to the image map designer is to find the balance between artistic needs to catch the viewer and functionality to allow the viewer to find information quickly. This balance issue presents opportunities for future research.

Figure 13
Summary Design Guide for Functional Image Maps.

"QUICK GUIDE"
for
Functional Image Maps

- Use simple graphics
- Use smaller rather than larger image sizes
- Clearly define hot spots
- Use unified rather than scattered groupings
- Choose icons to accurately represent information
- Design image map to model the structure of the information
- Use a minimal number of layers
- Limit the number of choices
- Include site-specific help

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Grabinger, R. S. (1993). Computer screen designs: viewer judgments. ETR&D, 41, (2), pp. 35-73.

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The Development Of An Interactive Multimedia CD-ROM: Lessons Learned

by Charalambos Vrasidas
Bruce R. Harris

Description of the Project

Cyprus Interactive is a hypermedia environment designed to be used as a resource by students and educators that are interested in learning about Cyprus. By clicking buttons and hot-text the learner can navigate through different sections of the project in a non-linear manner. Since the material was not structured in a sequential manner, no specific performance objectives were specified. The users are allowed to explore different aspects and topics about Cyprus. Quicktime movies, sounds, images, maps and textual information were all incorporated in this treatment.

Instructional Design Model

For the development of this project we designed our own model which guided the whole process. This model (see Figure 1) can also be used for the development of similar interactive multimedia treatments. The model was based on other theoretical instructional design models (Dick & Carey, 1990; Smith & Ragan, 1993) as well as on other factors involved during the development of interactive multimedia treatments (Park & Hannafin, 1993; Schwier & Misanchuk, 1993).

Goal Development

Cyprus Interactive had a project oriented goal. Therefore, there were no performance objectives specified. The purpose of this project was to develop a hypermedia environment which would contain information about Cyprus, an island in Mediterranean sea.

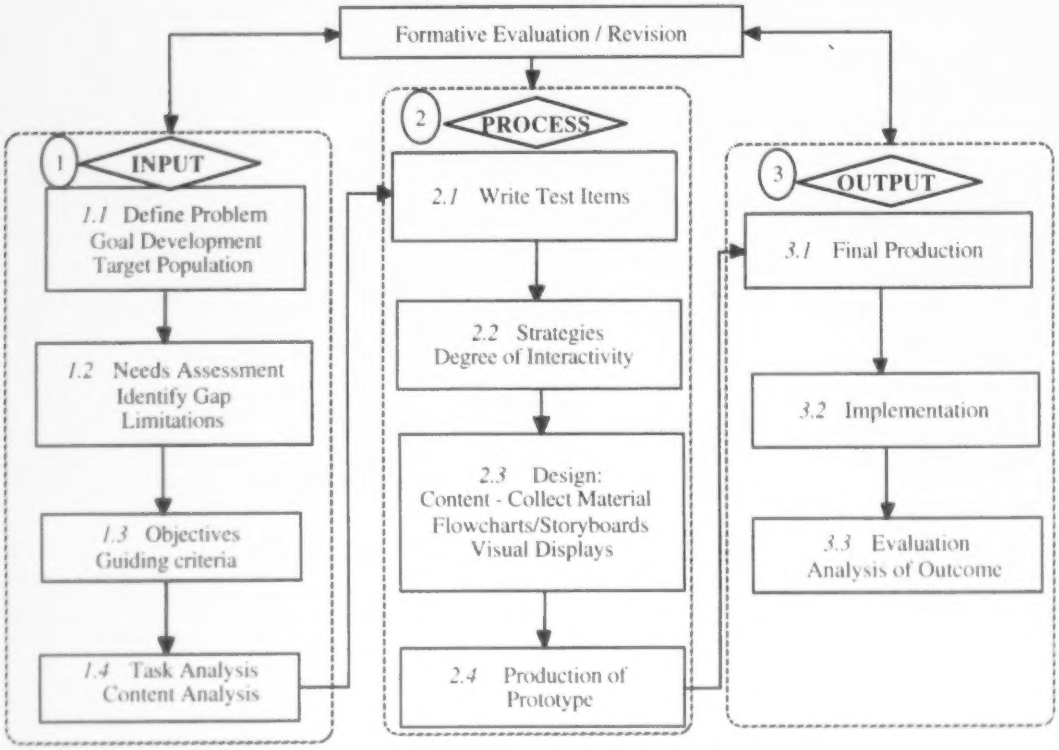
General goals:

The two general goals set for this project were: (1) the learner will have a greater appreciation for the culture and people of Cyprus, and (2) after exploring the world of Cyprus through this hypermedia program the learner will have a greater understanding and knowledge about Cyprus, the island's geography, people, history and culture.

Target Audience

The target audience of this project were students and educators in grades 11-12 and college level. In addition to identifying the target audience, at this stage it is necessary to also identify the target platform that the CD-ROM will be used. In this case, the target learning environments were those that use Macintosh computers equipped with double-speed CD-ROM players.

Figure 1
INSTRUCTIONAL DESIGN MODEL USED
FOR THE DEVELOPMENT OF *CYPRUS INTERACTIVE*


Formative Evaluation / Revision
1
INPUT
1.1 Define Problem
Goal Development
Target Population
1.2 Needs Assessment
Identify Gap
Limitations
1.3 Objectives
Guiding criteria
1.4 Task Analysis
Content Analysis
2
PROCESS
2.1 Write Test Items
2.2 Strategies
Degree of Interactivity
2.3 Design:
Content - Collect Material
Flowcharts/Storyboards
Visual Displays
2.4 Production of
Prototype
3
OUTPUT
3.1 Final Production
3.2 Implementation
3.3 Evaluation
Analysis of Outcome

Needs Assessment

Needs assessment assists instructional designers in gathering data about the identified problem, which data will drive the instructional design process in a way that it will be effective in improving performance (Rossett, 1991; Burton & Merrill, 1991). Very few students, and even teachers, know much about Cyprus. The gap identified was the lack of knowledge about other countries and cultures. The authors attempted to bridge this gap by creating a hypermedia environment which can make learning more interesting and exciting. The United States is one of the most diverse societies in the world and it is essential that its citizens know about other cultures. Hypermedia environments can be very effective in motivating students to learn.

Emerging technologies are changing the way we communicate and interact with each other. Hypermedia and interactive multimedia are part of these new technologies and they cannot be ignored. With the reduction of costs, due to technological advances, it is feasible for many school districts to develop their own interactive multimedia treatments on many different subjects.

Some of the advantages associated with this particular delivery system are: (1) it enables individualized instruction, (2) students can learn and progress at their own pace, (3) the multimedia nature of this delivery system suggests that information is presented in more than one mode (verbal, auditory, visual), and (4) it increases motivation. As a result of the advantages listed above, information presented in a hypermedia environment can more easily be retained, remembered and recalled by the learner. Therefore, instruction can be more effective and efficient.

A unit on Cyprus can be used in many areas of the curriculum. It can be linked to World History, Art History, World Geography, and in Multiculturalism. More specifically, the general goal stated for this project fits under the following Illinois State Board's of Education General Goals:

Fine Arts: (a) "As a result of their schooling, students will be able to identify significant works in the arts from major historical periods and how they reflect societies, cultures and civilizations, past and present."

Social Sciences: (b) "As a result of their schooling, students will be able to understand and analyze events, trends, personalities and movements shaping the history of the world, United States and Illinois." (c) "As a result of their schooling, students will be able to demonstrate a knowledge of world geography with emphasis on the United States." (d) "As a result of their schooling, students will be able to apply the skills and knowledge gained in the social sciences to decision making in life situations." (Illinois State Board of Education, 1985).

Constraints - Limitations

The major constrains involved during the development of a hypermedia environment or an interactive multimedia treatment, are the availability of the necessary software, hardware, time, budget, and personnel with the required knowledge and skills to produce the treatment. If there is a substantial budget, then some of the problems related to financial issues are easily overcome. For this project there was no budget. Therefore, the authors had to use the resources available at the time of production.

Decisions relating to software and hardware were based on: (a) what was available, (b) what was the budget for possible purchases, (c) knowledge of certain software and hardware, and (d) time available to develop the final product.

Task - Content Analysis

Once the general goal of the project and the target population were identified, and the needs assessment was conducted the next step was the content analysis.

Cyprus Interactive is mainly project oriented. The main analysis conducted was content analysis. In order to facilitate the content analysis process we begun with a content outline. The content outline was used to break down the content into small chunks that could be addressed independently. During the organization of the content outline, the various menus and submenus emerged. This process was particularly helpful for the following reasons: (1) saved a lot of time during the scripting, flowcharting and storyboarding, (2) helped in identifying missing and/or unnecessary information, (3) helped in organizing the content in a meaningful and easy to understand manner, (4) allowed quick reviews and revisions of the material, and (5) assisted in the identification of basic concepts from every smaller unit.

After the content outline, simple statements were assigned - in the form of objectives - to every menu and submenu. These statements were used to identify basic concepts related to the content area that needed to be addressed.

Design and Development

The design and development process was divided into the following interdependent stages:

(1) Degree of Interactivity

Decisions on the degree of interactivity and the options that would be provided to the learner at every menu were made during this stage. (a) the six options (Introduction, Geography, History, People, Other, Help) were always accessible at any time (except when the user was within the Help menu), (b) the "Quit." option is available all the time at every display, and (c) the submenu navigation consisted of the following buttons: Previous Menu, Find, Recent Pages, Previous Page, Next Page. Brief descriptions of the major buttons follows: (1) the "Previous" and "Next Page" buttons allow the user to backtrack or proceed one page at a time within a specific submenu, (2) the "Previous Menu" button allows the user to go back to the previous menu within which the submenu he is already in is located, (3) "Find" and "Recent Pages" buttons allow the user to go to places they already visited, or do a search for specific topics, and (4) the "Help" button provides on-line information on how to use the program. When the users exit help, they return to the display they were before accessing help.

Pull down menus include the following options: Restart, Print, About Cyprus Interactive(with credits), Quit, Write Notes, Read Notes, Final Test. For more information on the degree of interactivity, navigation and designing hypermedia environments, refer to Nielsen (1993), Stevens & Stevens (1995), Semraou & Boyer, 1994, and Park & Hannafin, (1993).

(2) Design of the Main Interface

The design of the interface began at the very beginning of the whole development process and it was constantly revised until the final production. The interface was designed so that it would: (a) be clean, readable, simple and easily understood, (b) be consistent with regards to the location of buttons and special information provided on the screen, (c) be aesthetically pleasing, (d) use colors and graphics that would not distract from the content.

(3) Flowcharting and Navigation

The authors drew out flowcharts indicating the options and branching that would be allowed at any part of the program. These flowcharts were mainly focused on the basic options provided to the user at any given time. This was not a detailed flowchart. The difficulty with flowcharts when developing a hypermedia environment is that you cannot depict all possible paths graphically because the learner can at any point go anywhere in the project.

(4) Storyboarding

Having all the steps above in mind, the authors proceeded with the storyboarding. Graphics, sounds, movies, maps and textual information were assigned to every display. This was a rough draft because during the authoring process things were rearranged. The storyboarding process provided a list of the different kinds of materials that would be needed and created a list of photos, maps, movies, sounds and text that were used. This saved a lot of time because it enabled the authors to avoid gathering materials that would not be used.

(5) Collection of the Material

During this stage libraries were created for all the different kinds of media that were used.

(a) Photographs. Some of the photographs were scanned from printed *materials and others* were captured from slides and videotapes. All of the photographs used were converted to 8 bit color/or grayscale PICT files. The photos were sized and assigned borders in Photoshop.

(b) Maps & Drawings. Maps and Clip-Art were used which were cleaned up in Photoshop and Illustrator. Drawings were done in Photoshop and Illustrator using a Wacom drawing tablet.

(c) Sounds and music were captured at the best quality (16 Bit, 44 MHz) and converted into SoundEdit 16 Pro, (8 Bit, 22 MHz, AIFF format).

(d) Quicktime movies & Animation. Movies were captured using Adobe Premiere and a Radius Video vision card from VHS videotapes. They were captured at the following specifications: 320x240 pixels, Radius hardware compression, Best Quality, 16 Bit 22 MHz audio. Then, titles and transitions were added and rendered to the following specifications: 240X180, Cinepak compression, data rate limited up to 190K per second, and audio compressed down to 8 bit 22 MHz. When planning to use quicktime movies on a CD-ROM, the best compression to use is Cinepak. Also, limit the data rate to 190k per second, when targeting double speed CD-ROMs.

It is advisable that, both audio and video, be captured at the highest quality possible and then down-sampled accordingly. In this way one can get the best quality possible out of the original materials (Heid, 1995; Stern & Lettieri, 1994). Animations were created using Authorware Professional's built-in capabilities.

(e) Text. Serif fonts are easier to read than sans serif and lower case type is also easier to read than upper case (Winn, 1993; Pettersson, 1989). Four different kinds of text were used. The main text was Times, black, plain, 15 points. The hot-text was Times, bold, blue, 15 points. The captions were Helvetica, brown, plain, 11 points in size. The titles we were Helvetica, bold, black, and size 16 points.

(6) Authoring stage.

During this stage the prototype was developed that went through many changes. Feedback was received from students, colleagues and educators. For the selection of the authoring tool used for this project the following software were reviewed: Macromedia's Director 4.0.4, Authorware Professional 3.0, Supercard, Hypercard, and Digital Chisel. The final decision was guided by the following criteria: (a) what were the program's capabilities in importing and exporting graphics, sounds, text, movies and animations, (b) was it necessary to learn any programming language in order to create applications? (c) how easy was the program to learn and use? (d) integration of peripherals: could laserdiscs and VCRs be controlled with this program? (e) were the drivers necessary for controlling peripherals provided? (f) what types of interactivity could be created? (g) could stand alone applications be created?(h) documentation: how well were the manuals written, and what was the technical support like? (I) could students' branching and answers be tracked and stored in external files (j) was a text editor and a painting palette included, and (k) was the software cross-platform? The software finally used for the authoring stage was Macromedia's Authorware Professional.

Authorware is an object-oriented authoring tool that doesn't require the use of any complicated scripting language in order to create applications. One of the strongest features of object-oriented authoring tools is that icons on the flowchart can very easily be changed and updated. You can also create various kinds of models that you can copy and paste as many times as desired on your flowchart, which can save a lot of time. Different levels of hierarchy can also be created with maps which allow the designer to see at a glance the structure of the whole application. Custom and system variables and functions, importing text, sounds, video, and movies, creation of animations, control of peripherals, networkablity, and the most important, ease of use are some of the features that make Authorware a very powerful authoring tool. In addition to the above, very easily the instructional designer can store the answers of the learner in an external file and even track the exact branching each individual followed.

Additional reasons for choosing APM 3.0 included the following: (1) the authors were already familiar with older versions of the software, (2) WIU already had copies available in the multimedia lab, and (3) Authorware is a cross-platform software. Files created on the Macintosh platform can easily be converted into Windows environments and vice-versa.

Final Production

After the prototype was tested and revised many times the authors proceeded with the final production. Some special steps that were followed in order to get the best performance out of the CD-ROM were: (1) all the files were checked with Norton Utilities to ensure that there were no viruses and corrupted files, (2) all the files were defragmented, (3) quicktime movies were compressed using Cinepak compression and with data rate limited to 190K (for double-speed CD-ROM players), (4) sounds used were saved as 8 bit, 22 MHz, and (5) photographs and graphics were also saved as 8 bit files.

Formative Evaluation

Dick and Carey (1991) argued that one of evaluation's major aims is to collect data that would guide the decision making process. Formative evaluation was a part of the development process. The treatment was constantly tested and revised in order to maintain an alignment between the three main stages of instructional development. Students, colleagues, producers, and educators tried the project and gave their opinions and feedback about the structure, content, navigation and interface. The processes of evaluation and revision were continuous. The best way to test instructional materials is to have the learners try them during the development process and get feedback from them. According to Smith and Ragan (1993) the four phases of formative evaluation are: "(1) design reviews, (2) expert reviews, (3) learner validation, and (4) ongoing evaluation" (p. 389).

Design Reviews

Before the actual production of the CD-ROM, the instructional design model was revised several times in order to assure alignment between the Input, the Process and the Output components. Questions that were addressed during this stage included: (a) Does the goal fit within the curriculum? (b) Is this treatment appropriate for bridging the gap identified in the needs assessment? (c) Are the content and approach used appropriate for the target learners?

Expert Reviews

Before the final production, the prototype was reviewed by experts in every area that was involved in the whole process. Instructional designers, multimedia developers, graphic artists, and content experts went through the prototype and gave valuable feedback.

Learner Evaluations

Twelve college students tried out

the CD-ROM and gave their opinion and feedback regarding the language used, navigation controls, the content, and the interface. Suggestions from the students were very valuable. The authors found out that in many instances they falsely assumed that the learner will know how to move from one section to the other. After the one-to-one validation with the students revisions were made to incorporate more clear instructions and navigation controls.

Lessons Learned

Working on this project was a great learning experience. Lessons learned from the whole process of developing the *Cyprus Interactive* CD-ROM include the following:

(1) Start with something simple.

(2) Always allow more time and plan ahead. Allow plenty of time for revision.

(3) Keep the screen simple and consistent. Do not overload with too much information. Provide ample white space.

(4) Use color consistently and in a meaningful way (green for go, red for stop, hot text always blue, etc.).

(5) Always give the learner the option to move back, exit, quit, and access help.

(6) Authoring for a CD-ROM and authoring for smaller applications that would be running from a hard-drive have some differences that will affect the performance of your program.

(7) Select the appropriate authoring tool. If you plan to keep records of the learners performance use a program that does that without requiring major scripting.

(8) Spend enough time in the content analysis, flowcharting and storyboarding. It is very helpful and it will save you a lot of time in the long-run.

(9) Do not allow too many options on the same screen. It makes the authoring stage very hard. Keep it simple and allow them only a few basic options at a time.

(10) It is very important to work with a team. The team for any multimedia or hypermedia project should include an instructional designer, a graphics artist, a content expert and the producer who will put all the pieces together. This allows the time to everyone of the members of the team to focus in their area and be more effective and efficient.

Software used: Authorware Professional 3.0, Adobe Photoshop 3.0, Adobe Illustrator 5.5, Strata vision 3d, Adobe Premiere 4.0.1, SoundEdit 16, Microsoft Word 5.1, Mirror Scan software, Omni page Professional, Fetch 1.2.

Hardware: PowerMac 7100 AV. - 36MB RAM, Quadra 840 AV. - 40MB RAM, Radius Video vision Card, 13" Audiovision Apple monitor, Sony CDW-900E Recorder, Wacom drawing tablet.

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Adaptation Of A Visual Readability Instrument To Multimedia Format

by Charalambos Vrasidas
Chris Lantz

Abstract

The Picture Readability Index (PRI) used in this study is a qualitative instrument that was based on research and theory from the areas of semiotics, linguistics, perception, visual literacy and cognitive psychology. It investigates the initial and prolonged stages in the perception of photographs according to the comparison of affective and cognitive domain classifications on a nomograph format. The two major limitations of this instrument were complexity and length. Administering the PRI via computer simplifies the data gathering process and enables easy administration to larger groups.

Visual Information Processing and the PRI

Visual information processing consists of a first glance, and a second more extended phase. The first glance is fast, less conscious, and works with a smaller amount of information. The second more extended phase is more conscious, takes more time, works with more information and details, and demands more attention (Spoehr & Lehmkuhle, 1982).

Winn (1993) referred to these two phases of perception as the "basic mechanisms" of "preattentive" and "attentive" processing (p. 57). The perceptual organization of visual information takes place during the preattentive processing. Attentive processing is a very selective mechanism which uses "attentive selection and those cognitive processes that further organize perceived information in preparation for its assimilation to existing schemata in memory" (p.58). For the development of the PRI the two phases of perception were incorporated in the process.

Readability of Visuals

Myatt and Carter (1979) found that children and adults prefer realistic photographs first, and realistic drawings second. Photographs are usually perceived as realistic and their credibility is rarely questioned. Instructional guidelines are not the only factors involved in the development of instructional visuals. Cost, marketing, attractiveness and the "subjective feelings of the designer" also play a significant role in the process of their production (Dwyer, 1972, p. 2). Textbook adoption decisions benefit from specific subject matter and pedagogical knowledge that are used to examine the reading level of text. Visuals are rarely examined in detail because there aren't any established criteria that could be used in evaluating their readability level.

Publishers widely use text readability principles which are based on comprehension and vocabulary difficulty and readability (Chall & Conard, 1990). Readability, as a criterion for judging textual content of textbooks, has been a major component of textbook evaluations and adoption decisions for more than seventy years. Photographs and illustrations have not enjoyed the availability of a similar instrument. A variety of general purpose media selection models have been based on expert opinion and principles that derived from several research studies and experiments (Romiszowski, 1988; Dwyer, 1972; Fleming, 1967). An early example of such guidelines for the selection of visuals for instructional purposes, as stated by Hoban (1937), were "truth..., photographic quality..., relevancy..., relative size of items..., and mechanical qualities..."(p. 160).

The Program of Systematic Evaluation, initiated by Dwyer in 1965 at Penn State University, was one of the early attempts to identify a set of criteria that would be used to select the appropriate visuals for certain types of educational objectives (Dwyer, 1994, p. 391). The guidelines deriving from visual research were not aimed to create precise prescriptions for effective visualization for all the learners. Instead, these guidelines were aimed to make sure that the majority of the students would benefit from a specific set of visuals. As Dwyer (1994) put it "these guidelines would possess the highest degree of predictability for the design and use of visualization, to ensure that a majority of learners, for whom the instruction was designed, would receive the intended message" (p. 385).

Goldsmith (1987) contrived a method of describing illustrations that encompasses both visible and invisible elements. Goldsmith's analytical model was mainly directed towards the comprehensibility of the illustrations. This model consisted of 12 elements. Four visual factors (unity, location, emphasis, text parallels) and three levels of communication (syntactic, semantic, pragmatic) were interrelated to create a matrix consisting of the 12 elements (p. 54-55).

Pettersson (1993) was the first to propose and develop a Picture Readability Index (BLIX) which was based on nineteen variables of the visual language. In experiments with ranking and rating test pictures he found that those pictures that had high index-values were rated higher than pictures with low index-values by both adults and children. According to Pettersson (1993), BLIX "represents the average difficulty or ease with which a picture can be read"(p. 158).

Photograph Readability Index

Attempts to measure the readability of instructional visuals employ principles from the fields of semiotics and linguistics. Visual semiotics principles are used to examine the codes used in visual languages. In a recent approach towards visual semiotics, Saint Martin (1990) linked semiotics with the gestalt theory of perception. In order to study the grammar of a visual language, it is essential that the basic elements of the language be identified. Then, semiotical analysis is applied that prolongs the first phase of perception towards two different levels. During the first level it examines the basic units of visual language. In the second level it examines the interaction, regroupings and dynamic tensions between the visual variables and how they group in order to communicate the message they were designed for. This approach derived from the verbal grammar which pays attention to the individual elements that make up a language (verbs, nouns, etc.), as well as to the syntactic laws according to which these elements are organized to convey meaning.

The PRI examines the initial and prolonged stages in the perception of photographs according to the comparison of affective and cognitive domains. The first part of the PRI investigates how individuals process information at a first glance. The second part examines how a photograph and its caption are processed together. Conventional text readability formulae have become methods of recording expert judgment regarding textbook adoption. They were designed to be used in conjunction with other measures. Adaptation of this concept to

Figure 1
PICTURE WHICH IS THE BASIS
OF ANALYSIS IN FIGURE 2

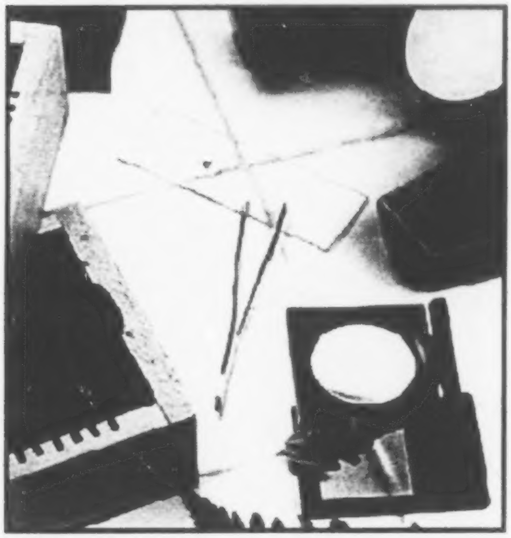
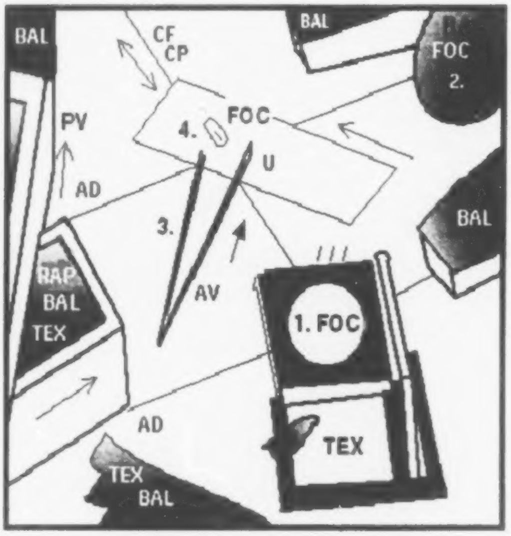


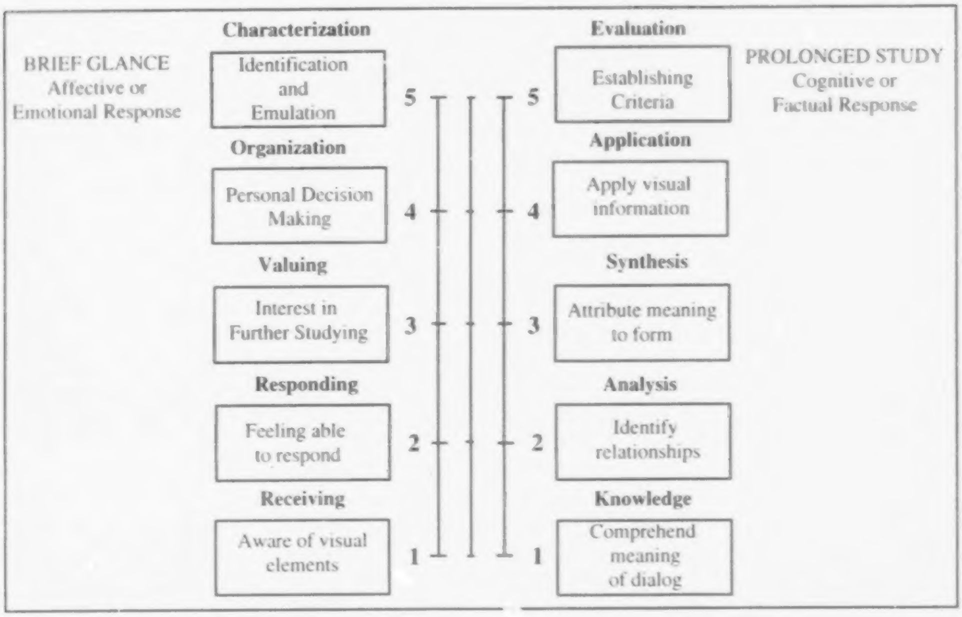
Figure 2
VISUAL SYNTAX NOTATIONS
OF VIEWER PERCEPTION


BAL
CF
CP
BAL
FOC
2.
PV
4.
FOC
U
AD
3.
BAL
RAP
BAL
TEX
AV
1. FOC
AD
TEX
TEX
BAL

VISUAL SYNTAX KEY OF FIGURE 2

AD - Active diagonal
AV - Active vertical
BAL - Balancing form
CF - Centrifugal
CP - Centripetal
FOC - Focal point of composition
PV - Passive vertical or minor vertical element
TEX - Texture
1, 2, 3,... - Perceptual order of major focal points
RAP - Repeating pattern

Figure 3
THE AFFECTIVE & COGNITIVE DOMAIN LEVELS
ON A NOMOGRAPH FORMAT


BRIEF GLANCE
Affective or
Emotional Response
Characterization
Identification and Emulation
Organization
Personal Decision Making
Valuing
Interest in Further Studying
Responding
Feeling able to respond
Receiving
Aware of visual elements
5
4
3
2
1
5
4
3
2
1
Evaluation
Establishing Criteria
Application
Apply visual information
Synthesis
Attribute meaning to form
Analysis
Identify relationships
Knowledge
Comprehend meaning of dialog
PROLONGED STUDY
Cognitive or
Factual Response

visual media is a logical extension of the visual grammar analogy suggested by Saint-Martin (1990). An example of a simple notation system used to define the visual syntax found in images is illustrated in Figures 1 and 2.

The PRI uses the levels of the cognitive and affective domains to structure questioning. The scores from the questionnaire indicate the level students have reached on the domains. Zakaluk and Samuel's (1988) two factor reading comprehensibility nomograph was adapted to accept short duration (affective) and prolonged duration (cognitive) classifications of data. The nomograph used for entering the data is shown in Figure 3.

The specific procedures of interrelating the affective and cognitive scores into one rating was suggested by Krathwohl, Bloom, and Masia's (1964) description of the domains as "analogous to a man scaling a wall using two step ladders side by side, each with rungs too wide apart to be conventionally reached in a single step... the attainment of some complex goal is made possible by alternatively climbing a rung on one ladder which brings the next rung of the other ladder within reach " (p. 60). This analogy illustrates the one sided or one ladder nature of much evaluation literature (Lantz, 1992). The comparison of the affective and cognitive domains in text readability formulae suggested the use of the nomograph.

For the first phase the image is flashed for 1/2 a second. From earlier experiments it was found that 1/2 a second is an average of the time necessary to perceive basic gestalts (Sperling, 1960). Short duration questionnaire items were written for each level of Krathwohl's et al (1964) affective domain. For the second phase the photograph and its caption were provided for consultation during the completion of the cognitive questionnaire. Cognitive items were written for each level of Fleming's (1967) adaptation of Bloom's

(1956) cognitive domain.

Outline of the PRI

The PRI consists of Phase I, Phase II, and the data coding procedure:

Phase I - Brief Duration

(1) Brief display of the photograph, (2) viewer directed to draw major elements, (3) affective questioning, and (4) coding of responses to domain.

Phase II - Extended Duration

(1) Prolonged exposure to photo and caption, (2) cognitive questioning, (3) coding of responses to domain, and (4) for visual data presentation the viewer drawing from phase I is labeled with the relationships between forms established in the phase II of the questionnaire.

Data Coding

(1) Enter coded data on nomograph, (2) determine the readability index by drawing a line between the affective and cognitive axis, and (3) present results of a pilot to a panel of adoption experts (Lantz, 1992, p.56).

Viewer reactions during the first phase of perception are often mainly affective oriented. Subsequent more prolonged study of an image can be primarily cognitive oriented. First responses to an image usually determine the viewer's willingness to further study the image. Therefore, affective and cognitive responses to images are interrelated. Affective responses usually determine the extent to which a cognitive response will follow and to what depth it will be processed. This is why the affective and cognitive domains are compared on a nomograph.

Validity, Reliability and Limitations of the PRI

The PRI used in this study was pilot tested by Lantz (1992). Because of its length, it was only administered to a small group of students. It needs to be further tested and revised. Administering the PRI to larger groups of students over a network from individual computer terminals and testing it over time, can lead to the establishing of a certain degree of validity and reliability.

The questionnaire items of the PRI were based on the affective and cognitive domains. The structure of the domains carried certain limitations. Krathwohl et al (1964) were aware of these possible limitations and were reluctant to publish the affective domain because it was regarded speculative in comparison to Bloom's cognitive domain: "we present it with some trepidation and full expectation of severe criticisms from many quarters" (p.14).

Bloom (1956) suggested that one of the major potential limitations to the cognitive domain was the level of generality which should be set "where the loss by fragmentation would not be too great" (p. 6). For visual material the risk of fragmentation is potentially higher than for textual material. Visual images often contain a far greater variety of potential interpretations than text. Adapting the cognitive domain for photographic material might be overstructuring or limiting the potential for expression (Lantz, 1992).

Images with low readability values should not be considered inferior to images with high readability values. Pettersson (1993) postulated that the Picture Readability Index "must not be an end in itself. There is always a risk associated with index values, since they can be interpreted as absolute values" (p. 158). Judgments regarding visuals should only be made within the proposed context the image is to be used. If the purpose of an image is to promote different responses and ways of interpretation then one with a low readability value would be better than an image with a high readability value. The readability rating deriving from the PRI should be thought of as a classification attempt and not a value judgment.

The results of an expert panel discussions and evaluation of the complete instrument suggested that most of the elements of the instrument were important (Lantz, 1992). Most of the data generated was considered "necessary" for the distinction of one group of images over another. The two major limitations of the PRI were complexity and length. The paper-and-pencil version of the PRI was too extensive to be applied to large populations and for applications with limited time restraints. The length could be made more manageable if all the components were shortened based on the common objectives of the instructional images for particular applications.

Saint Martin (1990) postulated that "the abundance and the variability of data in the visual language may require the instrumentation of the computer" (p. 187). Adaptation of the PRI into a computer-administered format has the potential of overcoming the major problems identified by the expert panel. In order to address the problems surrounding the PRI an authoring software was used which enabled the adaptation of the instrument into a multimedia format and the creation of a computer administered version. This computer administered version simplified the data gathering process and enabled easy administration to larger populations over a network.

Computer-Based Testing

In many testing situations questionnaire items can be too easy or too difficult for some students. Testing time is often a problem in a traditional paper-and-pencil test. When the test is too long and the students are asked to respond to all of the items, fatigue may influence their responses.

Olsen, Maynes, Slawson, and Ho (1989) conducted a study to compare the achievement scores of students who were tested via three testing methods: paper-administered testing, computer-administered testing, and computerized adaptive testing. In the computerized adaptive testing, each testing item was determined by the students responses to previous items. It was found that the computer-administered testing method required one half to three quarters of the testing time required by the paper-administered test. The computerized adaptive method required only one fourth of the testing time required by the paper-administered method. Also, the computerized adaptive method, provided "a more precise ability estimate with smaller variance" than the other two testing methods (p. 322).

Other studies (Luntz & Bergstrom, 1994; Olsen, 1990; Welch & Frick, 1993; Legg & Buhr, 1992) indicated that computer-based tests resulted in reduction of testing time and maintained precision. In addition to the reduction of testing time, researchers found high correlations between paper-and-pencil and computerized adaptive tests (Olsen, 1990; Koch, Dodd, & Fitzpatrick, 1990). Federico (1991) found that computer-based methods and paper-based methods "were not significantly different in reliability or internal consistency" (p. 345).

Advantages of the Computer-Administered PRI

There are many advantages associated with the use of a computer to administer an instrument. In this study some of the advantages deriving from the development of the computer-administered PRI were: (1) reduction of testing time, (2) as a consequence of the reduction of testing time is the reduction of the fatigue effect, (3) records and precise times are automatically stored by the computer; therefore, the management and organization of data is simplified, (4) the computer-administered version allows individualized testing and also enables easy administration of the instrument to large groups over a network, and (5) the projection of the image on the computer monitor is made easier. There is no need for preparing a room (ensure complete darkness, distance from screen, shutter to flash the image for .5 seconds, etc.).

Differences Between the Paper-and-Pencil and the Computer-Administered PRI

The differences between the two versions of the instrument are: (a) In the paper-and-pencil version the image is presented on a big screen during Phase I, and in print during Phase II. In the computer-administered version the image is presented on the computer monitor during both phases, (b) on the computer-administered version the students are not allowed to review their responses and make changes, (c) the quality of the photograph on the computer monitor might influence the responses to the questionnaire, (d) on the paper-and-pencil questionnaire the students can go through all of the questions at a glance; whereas on the computer-administered version they go through one item at a time, and (e) the response on the paper-and-pencil is made by marking the answer with a pencil. In the computer-administered version they respond by clicking the mouse or pressing a key which makes the responding easier (Federico, 1991; Green, 1988).

Limitations Deriving From the Adaptation of the PRI:

Although many studies found a strong correlation between paper-and-pencil tests and their equivalent computer-administered tests, it can not be assumed that any paper-and-pencil test is equivalent to its computer-administered version. Only when research has provided results that justify the equivalence of the two versions, should the two versions of the test be regarded as equivalent. Therefore, until studies had provided the results that justify equivalence, the results of the computer-administered version should be dealt with discretion (Dimock & Cormier, 1991, p.125).

There are certain limitations associated with the adaptation of the PRI into a multimedia format. The photograph presented on the computer screen is different in format than the photograph in the textbook. Therefore, student evaluators could be influenced by the format of the photograph (digital versus print) and respond differently. Also, proximity to the image is different in the two versions of the PRI because in the computer-administered version the image is flashed on individual monitors. The student evaluators are in very close distance to the monitor. Therefore, they would probably pay more attention to the computer than to the projected image in a big screen, which may influence their responses. Another factor that may influence response is computer anxiety. Computer experience among the students that will participate may influence the study results. Students with more computer experience may respond differently than students with less or no experience.

Procedure Followed for Adapting the PRI

The steps that were followed for adapting the PRI into a computer-administered format are listed below.

(1) Firstly, the authors selected the appropriate authoring tool. For the development of the computer-administered version of the PRI Authorware Professional was used. Some of the reasons that led to this choice were: it is an easy to use authoring tool, the authors were already familiar with it, and it can keep track of users responses including names, time, and answers to individual question items.

(2) Then, a flowchart was created that assisted in modularizing the instrument.

(3) After the flowchart, the authors created detailed storyboards illustrating the textual and visual information that would be included in every display as well as navigation options that would be provided to the student evaluators.

(4) All the photographs and drawings that were used were scanned and retouched in Adobe Photoshop.

(5) Then, a model with the multiple choice questions and the assigned variables necessary to store the answers was created.

(6) Once all the materials were ready, the construction of the prototype followed. The prototype was tested to ensure that it reliably stored the user's responses to all the individual items, as well as the time spent in every section.

(7) Lastly, the authors revised the prototype and produced the final cut of the computer-administered version of the PRI.

The next step would be to actually administer the two versions of the PRI to different groups. Only when research results suggest that the computer-administered PRI is equivalent to the paper-and-pencil version of the PRI, should the two versions be regarded as equivalent.

Conclusions

Educators and instructional designers often falsely assume that certain visuals will have the same impact on a group of learners. Cultural conditioning influences the way we read images. Learners from different cultural backgrounds and with different prior experiences, have different ways of responding to images (Pettersson, 1993; Mangan, 1978). Adoption committees and media developers do not have the benefits of an organized and established body of criteria for the selection of instructional images. The PRI was based on research which can provide suitable structure and design for establishing such criteria.

A possible future study would be to construct a computerized-adaptive version of the PRI. In such an instrument subsequent question items that will be presented on the monitor will depend on the viewers prior responses. When a viewer has achieved a level, she or he will jump to the next level without having to respond to all of the items. Such an instrument has potential of reducing the time needed to complete the PRI questionnaire.

Similar approaches and methods employed in the development of the PRI could be used to develop an instrument that could be used as a diagnostic tool by instructors of classes that use often visual media. The readability of images would not be addressed but rather the development stage and the visual literacy skills of the learners would be identified. Therefore, art, photography, and graphic design instructors might be able to use such a diagnostic tool to tailor instruction according to individual learner characteristics.

Adaptation of the PRI into a multimedia format was an exploratory study. A computer-administered PRI enables administration to larger groups over a network and simplifies the data gathering process. Further testing of the instrument by administering to larger groups can establish a certain degree of validity.

Attempts to measure the readability of instructional materials has certain limitations. As there are many different verbal languages, there are many visual languages as well. The PRI was not designed to be used in measuring the readability of all visuals. The instrument was designed to be used to explain the relationship between a particular set of illustrations and learners. Readability values should only be treated as a classification attempt with regards to a set of certain photographic and learner characteristics.

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Digital Photography and its Impact on Instruction

by Chris Lantz

Historical Context

Soon after the invention of photography the craft of hand film making was replaced by a film manufacturing industry. Film manufacture and development was mostly taken out of the photographers hands, making industry wide standards possible. These standards gave rise to such advances as the electronic light meter and exposure automation (Jenkins, 1975). Today the chemical processing of film is being replaced by a virtual digital darkroom. Digital imaging has also made new levels of consistency possible by the less volatile and more mutable nature of digital image storage. Despite small advances in photographic technology since the introduction of Kodachrome in 1934, the most dynamic gains have been, and are likely to remain in the electronic imaging sector. Once the basic technical barriers of memory, processor speed and image sensor resolution are solved, an advance in the utilization of photography comparable to the introduction of roll film is likely. The import of these developments is magnified when we consider their extension to the recent introduction of digital movies for the personal computer.

Previous electronic advances in photography were slow and incremental. In 1931 the invention of new electronic components such as powerful capacitors, prompted Harold Edgerton to develop an electronic flash light source. Its original purpose was to record moving objects on film but the technology was eventually applied to portable flash units. In the 1960's lasers became an important new light source for processes such as holography. More significant electronic innovations in conventional photography came with the first integration of the computer in the photofinishing industry, and then into cameras. Electronic imaging has been routinely used since 1982 for big budget applications such as commercial publishing and special effects in Hollywood movies. Use of highend personal computers for digital photography did not become practical on a mass market basis until the mid 1980's.Consumer level desktop imaging did not become available until the late 1980's. The development of low cost digital video imaging on microcomputer came as late as December 1991.

The main restraint on digital photography of the last decade has been the need for expensive computer hardware. The recent introduction of comparatively low cost, fast and memory intensive microcomputers has made imaging possible to those on limited budgets. Because of this new accessibility digital images are routinely integrated into interactive instruction, multimedia presentations, educational video and distance education. Photography is now a small subset of a new imaging field which is comprised of video, desktop publishing, graphic arts and others. Photo education has been transformed by digital photography. Undergraduate and graduate programs in electronic imaging have been introduced and virtually all undergraduate instruction in photography has a digital imaging component or core course.

Hardware Issues

The five main technical barriers to inexpensive high quality digital imaging are: disk storage, computer speed, camera sensor resolution, projection and hard copy output. Digitizing in photographic resolution requires large random access memory and disk storage capacity. It takes nearly 40 megabytes to store the uncompressed information contained in one

8x10 inch black and white photograph. Currently the photograph itself is a less expensive storage medium than 40 megabytes of hard disk storage. Efficient computer storage and dense sensing devices already exist but cost and size have not shrunk to the degree necessary for the construction of small, inexpensive cameras of photographic resolution. Currently every major overseas electronic manufacturer has industrial still imaging systems on the market in some form. The Canon Corporation has widely marketed their consumer level *Zapshot* still video camera. This camera can output low resolution images to conventional TV, a color thermal printer, or a color copier. Apple's *Quicktake* digital camera can directly input digital still images into computers without the aid of a digitizing board. Many of the hardware restraints on still imaging are effectively lifted for low resolution applications such as classroom instruction in digital imaging. Current low end computer models are adequate for many educational imaging tasks. Other more demanding applications of the digital still image such as commercial color separation require high end equipment.

Kodak's introduction of the Photo CD solved memory barriers for many still image applications in education and graphic arts. Lack of a low cost and easily transportable medium for student image files necessitated storing files in low resolution format. Picture files on Photo CD can be opened at resolutions ranging from low to very high. An additional advantage of the Photo CD is very inexpensive compact disk authoring of memory intensive multimedia programs through the Photo CD Portfolio disk.

In contrast to the success of still images, the present special effect and random accessibility advantages of digital movies are often offset by the disadvantage of low resolution. This low resolution is the result of the extremely high memory and speed requirements of the moving image. Apple's introduction of the Power PC can make digital movie quality and length more tolerable than its current four postage stamp size.

The cost of fast microcomputers will to a large degree be solved in the short term for entry to middle level imaging applications because cost of memory and speed lowers on a monthly basis. The cost of high resolution camera sensors, color hard copy and projection are more long term problems because the fidelity of film is hard to match with computer hardware. Many of these technical barriers are being addressed in colleges by the availability of costly permanent electronic classroom installations. Another approach is the use of many lower resolution portable systems that can be used in any classroom. The electronic classroom is one in which the professor can control from a central podium microcomputers and multimedia equipment for selective display on a video projector.

Impacts on Instruction

Digital still images and digital movie clips are now typical components of presentations in electronic classrooms or in individual interactive multimedia. Visually enhanced instructional programs can be inexpensively mastered on a variety of recently introduced compact disk formats. Educational television applications such as distance education have also been heavily impacted by the use of digital non-linear video because it can be compressed to greatly reduce transmission costs. Digital movies have many advantages over linear video tape systems that are specific to educational applications. The random access capability of digital movies is conducive to the integration of clips into instructional computing applications such as self-paced learning. Another main advantage of the digital video file format is its mutability within the computer for special effect applications. Digital data filtering has made professional editing effects accessible to those on limited budgets. The same tools available to the commercial producer are now available in low resolution to the home computer user.

Digital movies can be defined on two levels for the Macintosh environment . On one level, Apple's original Quicktime digital video format can be utilized as a final production tool. In its original format Quicktime video clips are small and low in resolution. Low resolution

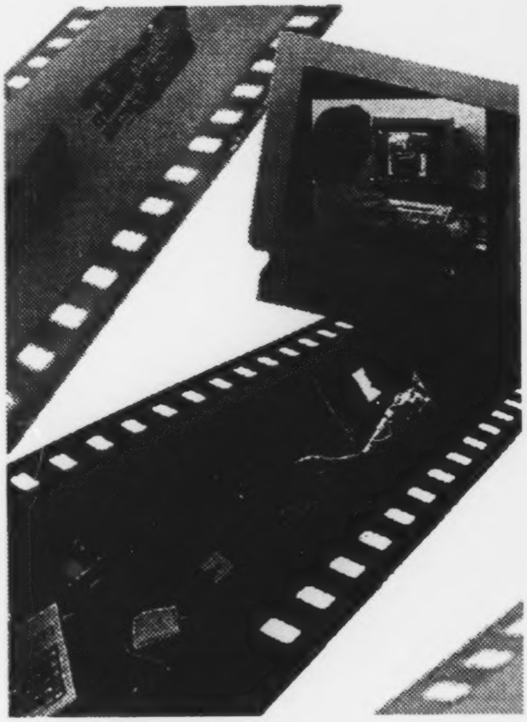
Quicktime is appropriate for applications which demonstrate basic motion or non-detail intensive visual information. It is adequate in introducing the concept of digital movies to many students at a time on low cost computers. On another level Quicktime can act as an introduction to higher resolution digital movie editing equipment used for the creation of a near-professional quality video production.

Evolution of the Digital Themes

Computer image processing technology has long been responsible for creating futuristic graphics, but as computer capacity increases so does its ability to render or simulate more complex natural forms. Once photographic information is digitized the computer is very flexible in its ability to manipulate the digital image. With the shift from manual to electronic methods, art directors are no longer limited to the restrictions of physical retouching tools and dyes. Common electronic work on commercial and educational images is becoming almost reconstructive, whereas in the past it was only cosmetic. Photographers used to be responsible for final products. Increasingly, they are being thought of as producers of raw products for input and perfection on electronic publishing systems. This attitude among clients often manifested itself only in high budget national advertising, but as technology has become cheaper and more accessible most photography is now affected.

Composite imagery of realistic elements in often unrealistic combinations is descriptive of many digital tabloid photos today. Figure 1 illustrates that several photos may be cut, pasted and blended into different combinations. These techniques are not unique to digital images, although digital composites are much easier to achieve. Early pictoralist photographers also explored the possibility that the realism of photography could be used as a special effect. Photographers such as Robinson and Rejlander were the first to create composite images that blended several photos into one. Their purpose was to pursue the formal Victorian themes but also to bring them to life by adding a new degree of realism. Robinson constructed scenes which resembled and even copied specific paintings and artistic styles. Rejlander worked in the 1850's and is well known for using print manipulations to increase the artistic capacity of photography (Coke, 1972). This work was immensely popular at the time but contemporary critics criticize it for not being original.

Figure 1
PHOTO MONTAGE CREATED IN PHOTOSHOP USING THE CUT INTO AND BEHIND COMMANDS



From its inception, the movement to establish photography as an art form was headed by painters turned photographers. The early movement is loosely termed pictorialism and started in the mid 1850's. The work of a well known pictorialist was Peter Emerson, who initially disagreed with the movement in his book: *Naturalistic Photography*. He argued that the "photographer's task is to discover the cameras own rules", not to apply the rules of painting. Shortly thereafter, Emerson acknowledged the photographer's free will to manipulate photography, but doubted the veracity of photography as an art form. Emerson was willing to accept the manipulation of photography but was not ready to accept it as an art form (Emerson, 1899).

The passing down of themes from one medium to another is essentially what is happening today with the introduction of electronic photography. Many electronic artists today who deal with digitized images come from the field of photography and they continue to work with many of the same restraints imposed by analog images. As initial photography emulated painting, initial digital imagery tends to emulate photography. As photography separated from painting and the pictorial movement, digital photography must also find it's own rules. Electronic photography is considered a lessor craft by many traditional photographers because it is thought of as a replacement for tasks better suited to film. Once the role of digital images is better defined it will be judged on its uniqueness apart from traditional photography.

The Digital Image and Realism

Much of current criticism emphasizes photography's subjectivity. According to Ritchin, photography "... constitutes a rich and variegated language, capable, like other languages, of subtlety, ambiguity, revelation and distortion (1990, 1). The photograph can distort detail, frame, vantage point and time. Fine art photographers and art critics have been leaders in disclosing the ability of the realistic photograph to deceive (Sontag 1973). These criticisms are often not part of popular discourse because of the trust in optical reality. Both the distorting and artistic power of the photograph will be greatly magnified through the advent of computer aided image making.

The public has come to expect the bending of reality in advertising, but it is also sometimes put to unwitting use in photojournalism. One of the most famous examples of tampering is the 1982 *National Geographic* cover of the Pyramids of Giza. In this example, the distance between the pyramids were compressed to make a horizontal photo fit into a vertical format for the cover. The editor referred to this as "retroactive repositioning of the photographers' viewpoint" (Ritchin 1990, 14).

Traditional negatives and prints are easily authenticated. But, when the image originates as digital data for direct input into publishing systems, this safety buffer does not exist. As the possibilities of manipulation become public knowledge, photographic realism could lose credibility. Public trust in realistic images could decline and as a result photographer's might be held more responsible for the reporting of reality. The public may come to trust the viewpoint and credibility of certain feature photographers, just as they may come to trust some reporters more than others.

Public assumptions that the camera doesn't lie promotes acceptance of information at face value. Photography has the ability to deceive without detection because of its perception as optical reality. This deception will be even more problematic with highly mutable digital images. These issues demonstrate a greater need for emphasis on visual literacy because of the increased ability of visuals to deceive and communicate.

Approaches to Imaging Education

Amidst early artistic innovations in the history of photography photo education was still mostly a technical course of study. The mixing of the art and science curriculums in photography originated in the Bauhaus School of Art and Architecture in 1919 Germany by professor Laszlo Moholy-Nagy. The curriculum joined the study of pure art and science with pragmatic craft. The school expounded the philosophy: form follows function. Moholy-Nagy's department was the first to offer a graduate degree program in photography. Today several technical and fine art programs are founding departments of digital imaging.

For those concerned with self expression, the most important value in a image is the meaning it conveys, and it is symbolism which conveys meaning in visuals. Symbols are more easily formed or manipulated in digital photography. To the commercialist, highly developed technique is often considered the preeminent vehicle used to express the clients vision or symbolism. Fine art programs traditionally emphasize expression and interpretation of meaning through symbols, and commercial or vocational programs emphasize. meeting clients needs through technique.

One approach to these differences in photo education was the "new photography movement." Frank Webster defined new photography through the belief that technique and meaning are whole and should not be separated. Photography is defined as a communicative process in which culture both influences the photographer and the viewer of the photograph. Webster compared traditional photography education with the training of writers. He argued that great writers do not read the dictionary cover to cover or draw upon a thesaurus like a pool of techniques. They integrate the knowledge as they need it. Such knowledge is a part of them, not drawn upon from some separate identity. Thus photographic techniques should be integrated into the photographic applications, not separated (Webster, 1985, 15).

In many contexts digital imaging education has focused exclusively on solving technical barriers. As in the beginnings of photography, the form follows function or the integration of only relevant technique takes on heightened importance with digital imaging. Because the digital image environment is so versatile and its technique so volatile to obsolescence it would be impossible to teach every tool available. Only through the application of broad features can digital curriculum be made relevant.

Conclusions

The pattern of photography's acceptance into society suggests that there was a period of initial experimentation where the novelty of the new process was sufficient to hold the interests of the public. As photography became more integrated into culture and the novelty wore thin, society demanded more of it. What started out as a mirror of reality was thrust into the new role of art, documentation and photojournalism, among many others. Once these applications of photography were socially digested, more contemporary movements took their place. Contemporary themes rediscover a novelty which was most appreciated at photography's inception. Electronic imaging is likely to receive a similar pattern of acceptance by society. Today the initial contributions of computer imaging are mainly recognized for their technical novelty. The content in many cases is irrelevant. Viewers will increasingly demand more content and context from computer imaging because the form will cease to be a novelty.

Digital photography is likely remove many of the technical restraints that define photography today. As a result the public perception of images is likely to shift from that of a precious document or object to a commodity or raw product which can be manufactured into any of a variety of digital products (Mitchell, 1992). Some of the perceived advantages of electronic photography in addition to providing new avenues of expression may also redefine the role of traditional photography. Traditional photography could become more valuable for applications that require a greater degree of authenticity or perceived realism. Since digital images are so easily transmitted and much more widely accessible, photographic images might become more desirable as a limited edition art object. Wide popularization of image art on electronic networks could actually increase the demand and popular support of the traditional craft.

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Electronic Performance Support Systems (EPSS): Making The Transition

By Susan Des Jardins and Harry Davis, Jr.

Understanding EPSS

EPSS is the buzzword for the nineties. Suddenly everyone is a PT (Performance Technologist). Some developed IPS's (Integrated Performance Support) and others have developed PST's (Performance Support Tools). No matter what term you use, they all relate to EPSS (computer-based just-in-time support during the performance of your work). Make sure you understand the concept.

Performance support comes in a variety of flavors. Most good training supports performance whether it's instructor-led or interactive multimedia training. So when we discuss performance support and EPSS, are we saying the same thing as training? Not really.

When talking about EPSS, one typically means a computerized system designed to support the actual performance of the worker at the time of need. EPSS's allow workers to perform with a minimum of support and intervention from others. This support is available on demand as the job is done and results in completed work.

An EPSS improves performance by increasing productivity. Employees receive job task support while working. An EPSS can teach through the "learn by doing" method of training, but it is not the same as traditional CBT. An EPSS may contain context sensitive granular training, but that is only a part of an entire support system.

There are few examples of fully developed performance support systems, but Gloria Gery's book, Electronic Performance Support Systems, describes various examples of support systems that companies have developed. Popular examples of performance support tools include Microsoft's Wizards in Access, Excel, Word, or PowerPoint. Wizards help you create a database, spreadsheet, document, or presentation resulting in the actual product rather than just telling or teaching you about it. You learn by doing it.

IPSS and PST: What's the Difference

It's important to distinguish between an **integrated performance sup-**

port system (a fully implemented EPSS) and a **performance support tool** (a partially implemented EPSS). Both are valid, both are useful, but the scope is different. Make sure you are clear about which you are building before you begin.

An **integrated performance support system** provides any combination of these or other components. The more components the better the support:

- expert knowledge (advice & coaching)
- searchable references and data
- granular training (cue cards and explanations)
- automated tools (interest calculations, spreadsheets, templates, or job aids such as sales tax charts).

A **performance support tool** is typically just one or a few of the components listed above. Some examples of performance support tools are Will Maker and Trust Maker by Nolo Software or Turbo Tax by Quicken. These products have a conversational interface which asks users questions and then produces a will, a trust, or your income tax return. The user does not have to know exactly why the questions are being asked or how the information is being used, as long as it is made into a final product.

Building an EPSS: Commitment

An EPSS project is an undertaking that requires crucial support from the client's organization. Just as a needs analysis is important for training, it is even more important for EPSS development.

- You need a commitment for the needs analysis and for project support. Support should begin at the top. Executives must provide commitment and encouragement (monetary and verbal) for the project.
- Corporate subject matter experts must cooperate with the design team.
- The designated users of the EPSS must provide input and be involved with the design of their product.

It is important to identify the roles and responsibilities of all involved to ensure the success of the project.

Building an EPSS: Skill Set

As trainers, instructional designers and, especially, multimedia developers, you probably have the skill set needed to design and manage an EPSS development effort. Your skills in needs analysis, design, development, implementation, and evaluation are the main components of EPSS development. If your technical skills are as strong as your design skills, then you are in an even better position.

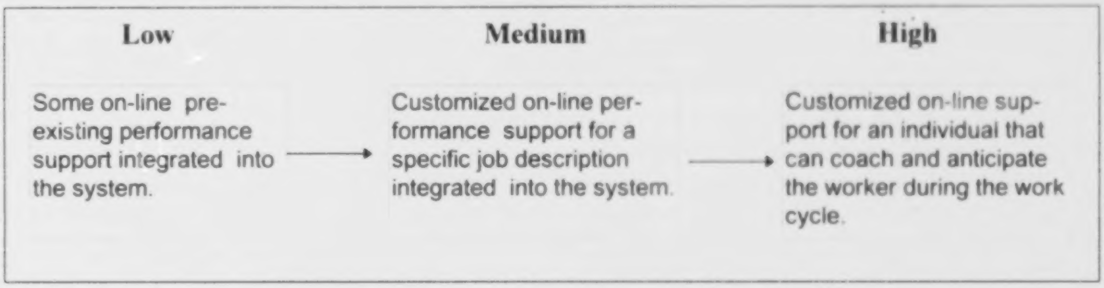
However, EPSS development requires a multidisciplinary team for proper system design, maximum efficiency, and speed. It should consist of instructional designers to ensure proper objectives, functionality, and solutions; subject matter experts for content integrity; application architects (multimedia and graphics); and programmers.

Building an EPSS: Level of Support

Another consideration is whether you will build an integrated performance support system from scratch or a non-integrated performance support system wrapped around an existing application.

Do not take the level of support for granted. For example, if you are building a support system for accountants and you are providing automated tax form completion tools, the development time and cost is significantly different for each level. Will the tool be an off-the-shelf (low) representation, a company customized form for all accountants (medium) or is this an intelligent expert system form that knows the individual accountant's training, background, and areas on the form where the most support is needed (high). You will also need to negotiate the level of support the system will provide. Figure 1 shows the three levels of increasing support.

Figure 1



Low

Some on-line pre-existing performance support integrated into the system.

Medium

Customized on-line performance support for a specific job description integrated into the system.

High

Customized on-line support for an individual that can coach and anticipate the worker during the work cycle.

The Methodology

(Refer to Figure 2 on the last page)

STEP 1-Marketing your EPSS

As quoted from the Disney organization: "Do the right thing to the right people at the right time." Marketing your idea for an EPSS to your organization needs to be the right thing for the right people at the right time. We suggest using our POW[3] concept to convince your employer. Remember to target performance, profit and productivity for convincing an employer of the need for an EPSS.

- **The Right Thing** - Is performance at a stand-still? Are there software applications that cause more errors or work than before their introduction? Do a preliminary evaluation of the situation and decide if an EPSS, a tool, or nothing is the "right" thing to pursue now.
- **The Right People** - You must have buy-in from the top down. The success of your project will be based on who will sponsor you, how long they will sponsor you and for how much.
- **The Right Time** - Are the company's profits starting to decline? Is the competition taking more and more business away? Does the corporate culture support the type of undertaking you're going to suggest? Is productivity suffering because of increased bureaucracy and workload? Is performance starting to steadily decrease with more and more dissatisfaction?

STEP 2-EPSS Planning

Clearly define the client's roles and responsibilities and participation. Establish a project team that includes client personnel.

- **Establish Project Scope** - Confirm that the project objectives parallel the client's corporate training strategy and business objectives. Also confirm the EPSS strategy, timelines, and milestones.

- **Examine Organization Goals And Needs** - Review the client's business goals, strategies, and plans and review the current EPSS plans to ensure that they are in line with the business goals, strategies, and plans.
- **Establish Project Team** - Ensure the entire project team fully understands the business reasons for building an EPSS.
- **Establish Time , Reporting, and QA Procedures** - Have the project team agree on an approach to tracking progress and reporting issues that affect the quality, budget, and timelines. Set specific checkpoints for review and revisions.
- **Determine Bio-factor Change Agents** - What Bio-factors are lacking? How can new ones be implemented and old ones reinforced?

STEP 3-EPSS Specification Analysis

Evaluate the technical feasibility of an EPSS from both a user and technical standpoint. Determine whether EPSS or a PST is an appropriate delivery mechanism. If an EPSS or PST is viable then define the functional and technical requirements for it.

- **Conduct User Feasibility** - Determine the extent to which users will be able and willing to use EPSS. Determine current and future software and hardware needs for the EPSS.
- **Conduct Focus Groups** - Determine how EPSS will affect your user population. Ask participants to review EPSS design documentation and assess how EPSS will affect current jobs. Include Bio-factor Change Agents in your focus group discussions.
- **Job Analysis/Task Analysis** - Determine the extent of job performance discrepancies and potential performance improvements and their impact on work, productivity, and profit (Conduct a Cost-Benefit Analysis).
- **Develop Functional Specifications** - Establish support components and match business objectives to components. Compare EPSS components (training, knowledge, reference, advice) to key business objectives. Define the functions and features required for each performance support component based on the performance analysis and determine the support strategy.
- **Develop Technical Specifications** - Define the technical hardware and software requirements for implementing the functions and features outlined in the functional specification.
- **Identify Existing Off-The-Shelf Software And Custom Software Development Requirements** - Identify general-purpose tools to meet any support component needs for common, day-to-day tasks like creating graphics, presentations, and reports. Identify any custom software and their requirements.

STEP 4-Present Findings- Decision Point

Present the analysis method used to justify your recommended solution to give the client sufficient information to either support or reject your conclusions. Present the alternative support methods, pros and cons of each, and a process for ranking the options. If the decision is to proceed with an EPSS then continue by getting your clients approval.

- **Summarize Findings -** Prepare a report that summarizes your findings concerning the technical and user feasibility of EPSS. The best solution could represent a combination of online and off-line functions, such as traditional classroom training, on-line procedures, and paper-based job aids and keyboard templates.
- **Present Findings -**Present the analysis used to justify your recommended solution to give the client sufficient information to either support or reject (with a sign-off) your conclusions.
- **Present Alternative Specifications -** Present the alternative support methods, pros and cons of each, and a process for ranking the options.

STEP 5-Develop Maintenance Strategy

The maintenance of an EPSS can be a significant task and must be done for the performance aspect of the EPSS to remain valid. Work with your client to identify the changes and updates that will be necessary to the data-intensive components by identifying how frequently data changes, by anticipating maintenance efforts and costs, and prepare the client to become self-sufficient in maintaining the EPSS components

- **Define Ongoing Maintenance Requirements -** Work with the EPSS technical team to determine procedures for continuing support.
- **Document Maintenance Plan -** Capture findings in a plan that shows an estimated time line for updates and frequency of those updates. Projections and assumptions will be made to determine the impact that maintaining the EPSS will have.
- **Develop Skill Requirements -** Assign maintenance tasks to appropriate client maintenance team members. Work with the maintenance team to define general training requirements based on current knowledge and skills.
- **Estimate Maintenance Costs -** Help the maintenance team members estimate the annual cost of maintaining the EPSS according to work effort (payroll cost), software licensing, hardware upgrade costs, and new release expenses.

STEP 6-Prepare EPSS Development Plan

Create a development plan for the EPSS from assessment through maintenance (Steps 2-10). Keep in mind that EPSS development is thus far a strategy for improving work force performance.

- **Prepare the EPSS Development Plan -** Write a plan that will guide your EPSS team and the client through the development of an EPSS using the major tasks in Step 7 - Build EPSS. Plan must include a set schedule with milestones and client sign-off points as well as a quality audit process.
- **Client Approval And Sign-Off -** Have client review and sign-off on the plan.

STEP 7-Build EPSS

Fully develop the performance support master shell then develop components. Work with subject matter experts to develop the knowledge-base, on-line reference/help information and integrated training sections. General-purpose tools will be identified, evaluated, and selected.

The metaphor for the desktop, graphical user interface, data structure, and data base model will be developed. Hand off the master shell to developers to produce all components.

- **Design And Prototype -** Design the specific performance support components identified. Expert systems (knowledge base and case-based advisory facilities) should provide customized advice and guidance in performing tasks such as problem solving, decision making, and troubleshooting Reference and help facilities should provide context sensitive information for content incorporating information from internal and/or external data bases. Training should be context sensitive and should provide tutoring, simulation, and coaching strategies for building the skills required for a given job performance. Develop the graphical user interface and the desktop metaphor keeping in mind that this will establish the overall functional and technical architecture of the system. Develop a working demo that conveys the functionality and technical requirements of the design. Get a sign-off from client.
- **Content Procurement -** Work with subject matter experts to develop the knowledge-base, on-line reference and help information and integrated training. General-purpose tools are identified, evaluated, and selected. Gather additional content needed such as manuals and databases for populating the system.
- **Programming And Production -** Produce the various hypermedia components including text, graphics, images, audio, and video and perform the programming functions using an integrated development systems. Develop custom-built programs for special functional or technical requirements. Develop the master programming shell.
- **Component Development -** Develop the support components from the design and integrate the content and automated templates and tools into the master shell.
- **Integration -**Integrate the content and the various performance support components with the system applications (if appropriate). Link, program, test, and debug the EPSS components with existing applications such as product inventory systems; word processing or spreadsheet packages; local area networks.
- **Formative Evaluation -** Beta test the EPSS system and make any fixes required.
- **Demonstration And Sign-Off -** Show the working system to the client and get their approval and sign-off.

STEP 8-Implementation

Install the system according to technical specifications and software specifications in a planned manner to all client locations.

STEP 9-Evaluation

Examine the effectiveness of the EPSS components through a systematic validation process including Bio-factor Change Agents. Assess whether the performance support components are functioning as designed to support the employee.

- **Conduct Performance Reviews Of The Success Of The EPSS-** Ensure the successful implementation and use of the Electronic Performance Support System within the organization.

Gather user feedback using follow-up evaluation procedures designed to assess the performance improvements after the implementation of EPSS.

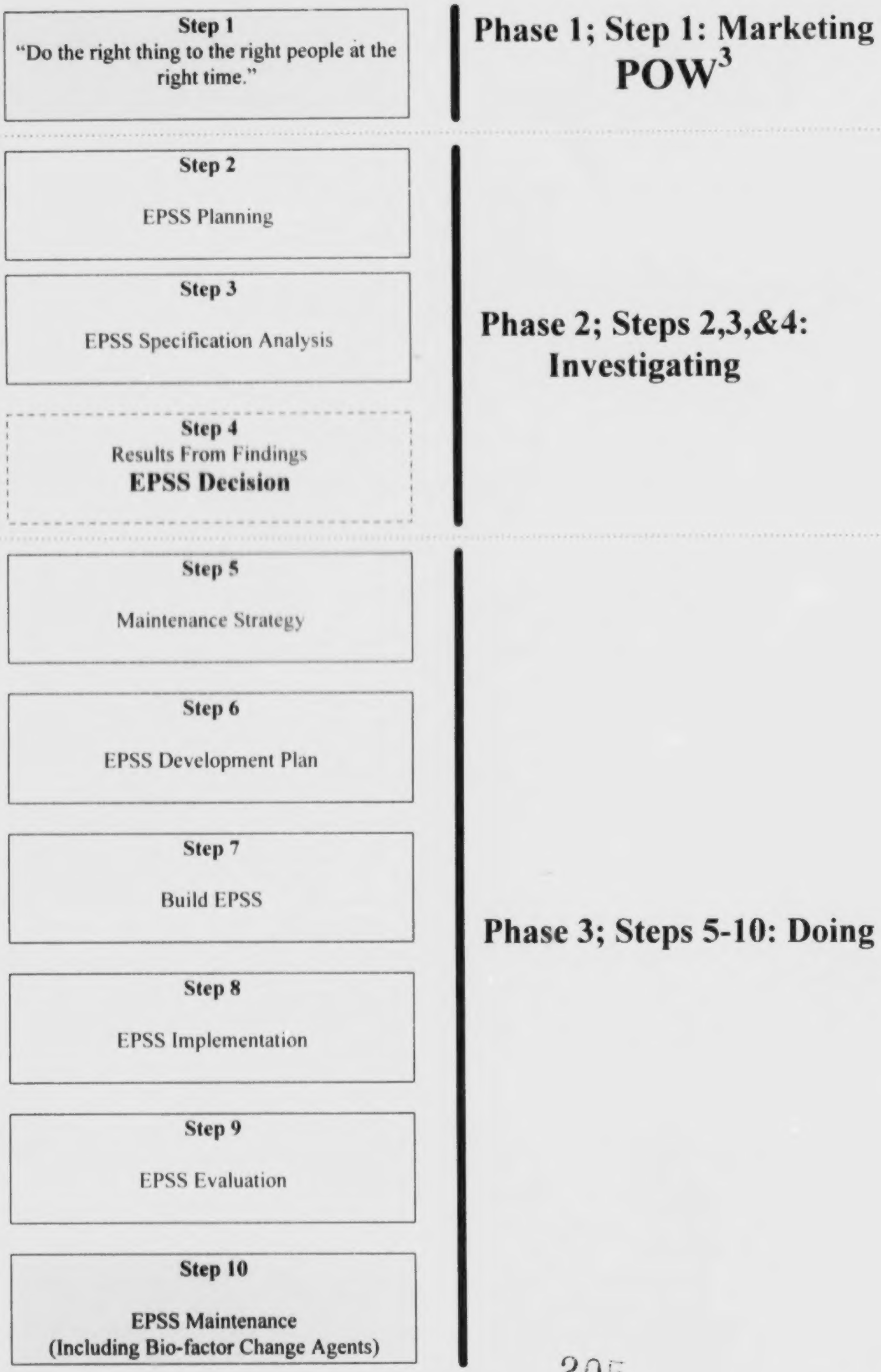
STEP 10-Maintenance Of The EPSS And Bio-Factor Change Agents

Ensure the successful implementation and adoption of the Electronic Performance Support System throughout the organization. Based on the evaluation results, enhancements and updates are made to the appropriate EPSS component or components. In addition, the appropriate personnel for maintaining the EPSS are identified, trained, and deployed. Maintaining the Bio-factor Change Agents is critical during the maintenance phase to keep performance and productivity up while limiting the dehumanizing effect of the EPSS.

- **Ensure Adequate Maintenance** - Make enhancements and updates based on the evaluation results. Support and train the appropriate people responsible for maintaining the EPSS.
- **Ensure Adequate Bio-Factors** - During the maintenance phase Bio-factors must be maintained and considered by a group of people who have been trained to look for the need and lack of appropriate Bio-factors in the work environment.

Figure 2

The Des Jardins-Davis EPSS Development Model


Step 1
"Do the right thing to the right people at the right time."
Phase 1; Step 1: Marketing
POW³
Step 2
EPSS Planning
Step 3
EPSS Specification Analysis
Step 4
Results From Findings
EPSS Decision
Phase 2; Steps 2,3,&4: Investigating
Step 5
Maintenance Strategy
Step 6
EPSS Development Plan
Step 7
Build EPSS
Step 8
EPSS Implementation
Step 9
EPSS Evaluation
Step 10
EPSS Maintenance
(Including Bio-factor Change Agents)
Phase 3; Steps 5-10: Doing

Teaching Media: English Teachers as Media and Technology Critics

Ladislaus M. Semali

With television, an event is broadcast or ignored: either it is in enormous headlines or it is no where at all. This power to choose what the great mass of people shall see . . . is altogether too great to be left to the judgement of a few television companies and to private arrangements made by committees and commercial sponsors.
-- Walter Lippmann

Many homes in America have a television that is turned on for more than seven hours per day. Individuals spend more time watching television than any other leisure activity and, cumulatively, far more time in front of the television than school; only work absorbs more waking time.

Furthermore, polls reveal that more people depend on television for news and information than on any other medium or source and that it is the most trusted source of news and information (Broadcast/Cable Yearbook, 1989; Gilbert, 1988; Roper, 1981, cited in Kellner, 1990, p. 2). As Lippmann claims in the above quote, audiences have no control over what they hear or watch on television, radio, or see in newspaper headlines. However, they have a choice to flip the channel or turn the page for more news to satisfy their appetites or to abandon what is boring. They do not elect or decide what makes the news headlines or commercials of that day. It might be, as suggested by Andersen (1995, p. 1), what is considered objective news or innocent cultural shows may have been strategically placed with popular programs by advertisers in this age of commercial clutter. Thus, Andersen contends that in a highly competitive commercial market, advertisers strive to incorporate their products within the broader media environment. In this way, persuasive messages appear to be authentic sectors of the landscape of popular culture, rather than deliberate advertisements urging consumers to buy products.

Indeed the media, particularly, television has become the nation's teacher of choice. In a discussion of the socialization effects of television, Kellner (1982) argues that television has replaced fairy tales and myths as the primary producer of children's tales. Even in present day programming, television continues to be one of the most important producers of myths and symbols in the society. He concludes that television has become a powerful socializing machine. Both television entertainment and information may well gain in power precisely because individuals are not aware that their thoughts and behaviors are being shaped by the ubiquitous idea and image machines of their homes (Kellner, 1990, p. 126). In a broad sense, this means that television provides continuous education throughout life, offering a popular day and night school for the nation.

One day in October 1994, after the US invasion of Haiti, the Philadelphia Inquirer published a front-page picture shot by Carol Guzy, a photographer of the Washington Post. This picture captured the looting of a school warehouse in Port au Prince while the US troops looked on. The caption read: "A Haitian woman, clutching a sack of rice that is caked on her face, lies injured during a food riot at the Catholic school warehouse in Port au Prince. Groups of men fought over the food yesterday, attacking even women and children. Passing U.S. troops did not intervene" (Inquirer, 1994, p. 1).

Troubled and perplexed by this graphic picture, I wondered what it would mean to my American students. What images might this picture evoke in their minds? What do images of the poor and hungry mean for my students. So I took the picture to my pre-service student teachers. My concern was how much did they know about the US intervention in Haiti? Did they know anything of the history of U.S. intervention in the Caribbean--Grenada, Panama, and now once again Haiti? What pre-existing understandings about America and the developing world did they hold that allowed for their reaction to the picture? What role in forming those understandings was played by the mass media on this day, as on most others, was uncritical--even celebratory--of American military intervention?

I felt the need, more than ever, to understand the models of the developing world and of cultural difference, broadly shared by white, middle-class Americans, that many of our undergraduate students brought to the classrooms and that I myself struggle with and against.

After much consideration, I turned to the examination of network news, particularly the visual pictures presented as one of the most culturally valued and potent media vehicle shaping American understanding of, and responses to, the world outside the United States.

My interest was, and is, in the making and consuming of images of the non-western world, a topic raising volatile issues of power, race, and history. What does popular education tell Americans about who "non-Westerners are, what they want, and what our relationship is to them. As any other popular media in America, the network news exists in a complex system of artifacts and communication devices: newspapers and magazines, television news and special reports, museums and exhibitions, geography and world history textbooks, student exchange programs, travelogues and films from Rambo and Raiders of the Lost Ark to El Norte.

Yet these diverse contexts are in communication with one another, purveying and contesting a limited universe of ideas about cultural difference and how it can or should be interpreted. To use television network news or newspaper photographs as pedagogical sights is to study not a single cultural artifact but a powerful voice in an ongoing cultural discussion of these issues. The history, culture, and social reality of North-South relations is primarily written, of course, in corporation boardrooms, government agency offices, and encounters between tourists, bankers, military personnel, and State Department employees, on the one hand, and the people of the Developing Nations on the other.

The role of a cultural institution like the Network evening news or the Philadelphia Inquirer and its viewers and readers, respectively, might seem small by comparison. But its role is not simply to form an "educated public," nor is it simply to mislead or err in describing those relations; it can also provide support for American state policies and for voting and consumer behavior (Lutz & Collins, 1993).

While a front-page picture of the Philadelphia Inquirer is seen as a straightforward kind of evidence about the world--a simple and objective mirror of reality--it is in fact evidence of a much more complex, interesting, and consequential world of reality. It reflects as much on who is behind the lens, from photographers to newspaper editors, and graphic designers to the readers who look--with sometimes different eyes--through the Philadelphia Inquirer's institutional lens.

A photograph can be seen as a cultural artifact because its makers and readers look at the world with an eye that is not universal or natural but taught to look for certain cues. It can also be seen as a commodity, because it is sold by a newspaper concerned with revenues.

The visual structures represented in the photograph, and the reading rendered by audiences, can tell us about the cultural, social, and historical contexts that produced them. An attempt to study visual structures leads us to the way in which meanings are offered to us and **our part** in actively making sense of them. It is important to keep in mind that the assumptions we make, what we consider as common knowledge or common sense, or "**general**" knowledge, or widespread beliefs and popular attitudes, are conventions we form as part of our cultural knowledge.

The fundamentally critical perspective I take on media and its social context is thus linked in a range of ways to deeply personal concerns. I am concerned with how to imagine and value difference, how to foster both empathetic forms of understanding and historically grounded perceptions. These perceptions emerge out of childhood and adolescent experiences and the choice one makes of adult work. My goal here is to bring a critical perspective into the ways media, such as newspaper photographs are constructed, to point out some of the prevailing cultural ideas about others through which any photograph of the non-Western world has often been filtered, and to raise questions about what could be done in the classroom and in the curriculum to develop such critical perspectives. This kind of critical theory of media must analyze the ways in which media images organize experiences and then attempt to specify their effects and deconstruct their linguistic discursive positions.

We must ask: How do pictures -- both moving and still-- create for us an almost palpable world of objects and events? As a young professor at a state university, I am struggling to teach about cultural differences in ways that are meaningful to undergraduates in the 1990s and beyond.

My teaching of media texts as a form of textual construction is embedded in the assumption that audiences bring individual preexisting dispositions even though the media may contribute to their shaping of basic attitudes, beliefs, values and behavior. As summed up by Lusted (1991, p. 26), at the core of such textual construction are basic assumptions which include four postulations.

First, all media are a construction. Any media text--written or electronic, including in large part the school curriculum is a construction. Also, the worldview, information and perspectives created by both mass media messages and the school curriculum are primarily a construction of reality rather than reality itself.

In a nutshell, textual construction incorporates the way the media use conventions, how audiences make meanings from them, and how these meanings are applied within a cultural context (Lusted, 1991, p. 123). Such construction represents conscious and unconscious decisions about what knowledge is valid and valued.

Second, audiences negotiate meaning. While media content and the producer's intent are significant, different audiences respond to these messages in different ways. Similarly, the message and the method of presentation in our schools is accepted or rejected by students based upon their culture and needs including past experiences, racial, ethnic and socio-economic status.

Third the curriculum represents ideology and values and has social and political implications. Mass media messages are based on assumptions of truth and affect social and political behavior in a variety of ways. Rather than representing equality of opportunity or principles of equity, the content, organization, culture and climate of both education and the mass media as institutions privilege certain sectors of society while ignoring or marginalizing others. This can happen in the frequency of representations / responsiveness, or in the nature and quality of these representations and responses.

Fourth, the nature of media messages can affect social attitudes and behavior. Equally, the nature of the curriculum both plain and hidden, can affect social attitudes and behavior. For example, the self-esteem of minority audiences can be affected by negative representations. Such representations can also affect perceptions of majority students toward minorities.

For many people, individual attitudes and worldviews about others seem natural and common knowledge. What seems so natural is actually learned from our earliest moments and becomes part of our social experience.

It is not surprising therefore for teachers to take television for granted sometimes. Today viewers everywhere tend to accept it as a window on the world, and to watch it for hours each day. Viewers feel that they understand, from television alone, what is going on in the world. They unconsciously look to it for guidance as to what is important, good, and desirable, and what is not. It has tended to displace or overwhelm other influences such as newspapers, school, and church. Thus, television has become our constant companion, in the home, in the hotel room, in the hospital--educating and entertaining us from the nursery school to the nursing home, from womb to tomb!

But as television and other electronic media grow in importance, social problems in America have grown proportionately. Although critics do not claim a cause and effect relationship, they have by and large accepted the proposition that violence, drug abuse, and teenage pregnancy, result from a media culture that celebrates consumerism and instant gratification while tolerating undercurrents of prejudice and bigatory.

Author Richard Louv quipped, "Television hijacks so many parts of our brain, that it leaves little room for self-generated images and ideas . . . Television is simply a thief of time--of creative time, of family time" (cited in Aronson, 1994, p. 29).

In the span of a lifetime, television and other electronic media have replaced print as the primary medium by which we tell our stories, report our news and decide on our purchases--and our votes, particularly in an election year. It has become the definer and transmitter of a society's values (Barnouw, 1966, cited in Kellner, 1990).

Time has come for educators no longer to consider television and other non-print media as the enemy, thief or the ubiquitous bubble. Students feel the onslaught of the information age even more acutely than their teachers and are less capable of coping with its demands and of making sense of the complex world it presents. Teachers can help their students cope with this complexity by suggesting analytical frameworks and perspectives for sorting out and thinking critically about them.

Teachers as Critics

Teachers in many school districts in Pennsylvania pay little or no attention at all to television, perhaps because they accept TV as a given. The burgeoning media literacy movement which is seeking to change the relationship between the media and educators and to engage students in a critical analysis of television images and other mass media messages has not caught up in many Pennsylvania schools.

In assessing the level of critical media awareness, a group of 20 teachers attending a media literacy workshop at the Pennsylvania State University, Summer 1994, voiced their opinions about classroom practice when asked to rate the frequency with which they undertook certain core critical media literacy activities. On a scale from 1-5, the teachers indicated how often they undertook these core activities in their classrooms ranging from never, not very often sometimes, often, to very often. The mean scores of their ratings are given in Table 1.

TABLE 1

Teachers Ratings on Media Practice in the Classroom

	STATEMENT	Mean Rating
1.	I talk to my students, friends and colleagues about the media and its social and political influence.	2.83
2.	I no longer just turn on the TV or a video game; rather, I deliberately choose media experiences to which I want to be exposed.	4.17
3.	I seek out alternative sources for news and information.	4.11
4.	I teach my students critical viewing of television programs; thus enable them to detect bias or stereotypes of gender, race and ethnicity.	2.50
5.	I can readily identify common techniques used by advertisers to convince us to buy products, thus becoming less responsive to those techniques.	3.53
6.	I support smaller, local media outlets (newspapers, magazines, cable channels, radio, etc.).	4.32
7.	I create media experiences (videotapes, audio tapes, newsletters) that express my own viewpoints.	0.0
8.	I help my students identify needs the mass media fill in their own lives so that they begin to pick and use the media to meet those needs more effectively.	2.11
9.	I write letters to advertisers, TV stations, radio deejays, sitcom producers.	1.63
10.	I help my students to question the role advertising plays in fueling the consumer lifestyle, perhaps beginning to consume less and thus live more responsibly.	2.47

The teachers gave a high mean rating of 4.32 to activities that support local media outlets, followed by a rating of 4.17 to indicate that in fact they choose media experiences which they wish to watch or be exposed to. Even though teachers indicated that they often seek out alternative sources for news and information, there were no indications as to what these alternatives were.

The data revealed that teachers did not write to advertisers or TV stations or media producers to comment on programming or to express their opinions about bias or stereotypical programs. Activities engaging their students in the production of media were non-existent. These results, even though limited in scope are seminal in understanding how teachers view the media and whether they apply critical practice in their classrooms.

The overall picture shows that the teachers who participated in the workshop were not aware of what they could do about media in their language arts classrooms. Furthermore, nonprint media, especially those that are part of students' everyday lives, are still considered as isolated phenomena in schools.

Contemporary critical theory and media studies point out that the most glaring failure of US schools in this decade is the failure to situate learning in its cultural context (Sorenson, 1989). Many English teachers, for example, still teach literature and literacy (reading) as if television, motion pictures, and computers did not exist. What we are still missing from the school canon are examples of the literary genres of our times: films, television series, serialized drama, and multimedia experiences, all of which provide their own versions of the best of human expression and aesthetic experience.

These new media provide their own criticism of life. They are for Barbara Tothrow, who leads classes in video production and media literacy at Alvirne High School in Alvirne, N.H., the new accent of the English curriculum. "It makes sense to teach our kids how to read this medium just as critically as we have traditionally taught them to read print" (Sorenson, 1988, p. 42).

As educators, we can no longer ignore the fact that increasingly, nonprint media -- including television, music, video, videotape, film, radio, compact disk, and hypertext for personal computers -- have become primary sources of information and recreation, as well as emotional and artistic experiences for Americans. Efforts like the teachers' workshop of Summer 1994 or the regional workshops sponsored by Newspapers In Education (NIE) group for teachers to learn how to use the newspaper to teach students how to deconstruct newspaper messages, can be a wonderful opportunity to develop students' critical awareness in the media and how the media represent people.

In an attempt to forge new ways of integrating popular media across the curriculum, the summer workshop alluded to above, outlined areas of media literacy that could help teachers make a difference in English or language arts classrooms.

The workshop encouraged these teachers to join the estimated 3,500 teachers nationwide committed to work towards integrating forms of media literacy into their teaching. The workshop covered four areas: (1) analyzing codes and conventions of language, (2) analyzing personal pleasure, understandings, and experience, (3) analyzing cultural, ideological meanings, (4) analyzing commercial overtones and economic strategies.

Borrowing from the field of semiotics, an important area of study of textual analysis, all texts are constructions of meaning -- **constructed** through language. To many teachers and students, texts, like weekly television programs, newspaper articles or pictures like the one described above, might seem simple and obvious reflections of reality; but when teachers and students begin to read them critically (and deconstruct them as languages), they begin to understand them in a new light: as complex, technical constructions or representations of reality, not reality itself. What they may have often sensed, then, as "realistic" might more accurately be described as their familiarity with the codes and conventions of the language used to construct imagery.

As far as television is concerned, the conventions used seem so familiar to many students in our culture. For example, most television programs use characters well known to viewers. These characters already appeal to a loyal audience with their established identities. It is acceptable for familiar characters whom viewers know and love--to smoke cigars and say "damn" (e.g., Northern Exposure), and to persuade audiences to purchase goods, services, and gadgetry they do not really need (e.g., Michael Jordan advertising for Nike; Whoopi Goldberg for AT&T or Candice Bergen (Murphy Brown) for Sprint).

Because of the dearth of media literacy awareness in classrooms, it is not surprising to find youngsters who study literacy and literature for 12 years and still graduate naive about the techniques and devices used to capture their attention and imagination, about the cultural codes that reflect and shape their thinking in their electronic literature. They have not been taught to be critics!

Inasmuch as today's children come to school from homes and communities which provide them with wide exposure to nonprint media, it is crucial that literacy education teachers draw upon this background, both to recognize the students' knowledge and to develop the students' critical thinking about nonprint media.

It is in this respect therefore that students must develop the knowledge, critical awareness and technical skills to become participants in, creators of, thinkers about, and commentators on, the nonprint media that are so pervasive an influence on their lives (Aronson, 1994, p. 31).

This means that teachers often must use materials that, while potentially controversial, need to be examined so students can confront the stereotyping, the deluge of propaganda, and editorial gatekeeping so prevalent in the media. Such study will allow students to discover how nonprint media works are indeed constructions of reality that have commercial, ideological and value messages.

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Challenging Popular Media's Control By Teaching Critical Viewing

By Richard A. Couch

> "Contemporary students need to learn how to critically listen, critically read, and critically view in order to critically think. The alternative to critically thinking about what citizens see, read and hear is unpalatable for a democratic society. Images over substance resulting in emotionality over rationality is the death knell of reasoned discourse. Critical viewers, however, will demand something worth viewing and will require that more substantial arguments from a variety of sources be made available through a variety of media." (Dr. John Splaine, University of Maryland, in Hamner and Alexandrowicz, 1992)

Why Critical Viewing?

Today's youth are bombarded with video messages as they spend an average of 22 hours each week in front of a TV. Nielsen Media Research announced in August, 1994 that the number of U.S. homes with TV sets has grown 1 percent from a year ago to 95.4 million or 98.3 percent of all homes in the country. Sociologists predict that an average teenager will have watched more than 23,000 hours of television before high school graduation. (Hamner and Alexandrowicz, 1992) This generation of viewers is certainly not the only generation of TV addicts, but they enjoy the widest variety of choices in programming. The "MTV generation" has found the wide variety video that entertains them, but do they make conscious choices or simply surf the channels?

The typical "Power Rangers" episode spends 25 to 35 percent of the time fighting and in spite of the "pro social" messages that often conclude each episode, the violence was not essential to the plot or character development yet violence was generally the preferred means of conflict resolution. Programs often gloss over the consequences of violence inviting young viewers to imitate the martial arts techniques that they see. Anyone who has been on a school ground lately can attest to this fact. The impact of the show has promoted a dialogue over censorship in Canada. New Zealand has dropped the show completely and Scandinavian network TV- 3 dropped it then reinstated it (*Connect*, 1994). Is censorship the answer? Can movies and TV shows be socially responsive, highly profitable and artistic? The media moguls will say that we are only producing the shows people want. In his book, *A Martian Wouldn't Say That*, Leonard

Stern related many funny stories. One TV executive suggested, "We must de-emphasize violence this season. Make the room red so the blood won't show." (Austin, 1994). Those of us involved in the field of visual literacy have explored the implications of censorship and many of us feel that a better alternative to censorship is teaching people about visual/media literacy and how to think about TV critically.

What Is Critical Viewing?

Media literacy is the ability to be aware of how images and information are presented by various media and the properties inherent in each medium that may dictate the format (Hamner and Alexandrowicz, 1992). Much of what is communicated on TV is communicated because of the format or other characteristics of the medium, e.g. newspaper is much different than TV.

Critical viewing means actively thinking and evaluating the messages and images that glow at us from the television set. Critical viewing skills are necessary for constructive intellectual use of the information received. An awareness of the properties and characteristics of television aids viewers in the critical viewing process. By understanding how television behaves, the viewer knows how to intercept images and decode them logically.

The press, both written and video, has become more aware of how political advertising uses TV's characteristics to create specific images and emotional responses. Most commentators and "spin doctors" often point at the use of camera angles, dramatic musical scores and phrase repetition when describing the influence of the media. Even adults may not be aware of the techniques used by the director. Many people are unable to critically evaluate the intended message. Adults, young adults, and children need to be learning how to make meaning from these visual messages.

There are certain characteristics inherent in television which are found in TV programming of all kinds. This is a starting point on the road to critical viewing. Critical viewers, for example, know that the camera is the conduit to the viewer. The viewer sees only what the camera provides. Camera angles or placement and camera movement have an impact on the viewer. Editing techniques have a similar effect. For example, a camera shooting up at a speaker creates an image of power, and quick cut edits can create a sense of urgency, power and leadership.

Critical viewers know that emotional involvement keeps the audience attentive. Most television programming is commercial and contains paid advertising. Successful commercial programming must hold its viewers, which means that the viewer must be emotionally involved. Subject matter that is unusual, contentious or controversial is often used to grab or hold the viewer's attention. Conflict, whether real as seen on talk shows or fictionalized in prime time dramas or sitcoms also holds the audience. Producers and directors know this. Do children assume that all problems can be solved by simple solutions as is often done in a 30 minute or hour long TV show? Are these the messages we should be sending our kids? Or is the message that violence is the quickest and easiest solution to a problem the message we should be sending? Viewers need to know the dramatic structure of television programs in order to be critical viewers as well; without conflict, no one would watch. In many cases on television, spoken language may only be used secondarily to emotion-evoking images. The result is that the viewer may feel an emotional response but may not know why they feel what they do.

Critical viewers will know that the material seen on the screen was preselected. The video product that reaches the viewer is a processed product. Camera operators, directors, producers and often a large crew worked together to produce the program or news segment. Many choices are made throughout the production process, including some choices that may change the perception of the event or create certain impressions of a program. Condensing a long speech into a short 20 second sound bite is common in news reporting. The bite may not accurately reflect the intended meaning of the speaker whether a criminal or a politician. The particular bite may be taken out of context to make the politician look bad if the news producer does not agree with the politician's stand on an issue.

We can use our knowledge of how TV works to help teachers, parents, and students understand how the managers of media are trying to manipulate us. Critical viewers know that directors often use the "talking heads" technique implying legitimacy for the speaker's point of view and suggesting the speaker has status as an important person; the news anchor is a good example. We can ask children to try to come up with other visual techniques which would have conveyed the message differently. Filming wild animals can be dangerous to the camera person and disturbing to the animals. We can ask our students what responsibility does a camera person have in getting a good picture. Directors can use a low camera angle and extreme close-up shots to emphasize a speaker's statements. We can have students count the number of times the technique is used. Ask students to perceive the background of a video or the music and how important it was in influencing emotion. Would it change the impact of a documentary if Walter Cronkite was not narrating it?

A director can capture the viewer's attention by selecting a particular camera shot. A speaker on camera may be making a point when the camera cuts away to an uninterested listener. How is that message different than if the camera had cut away to a very interested listener?

We need to make people aware of the techniques that are used to manipulate us. We also must teach people how to think critically about the true messages behind the images. Image isn't everything as the famous tennis player would have us believe; content is important too.

What Can Parents and Teachers Do?

Parents and teachers can support critical viewing by asking children to:

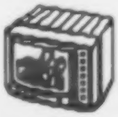
- Control their viewing time; make choices on the quality of the program; make a priority list of programs the child wants to watch and limit the amount of time; require the children to do other things.
- Analyze what they see and hear; ask them to evaluate the quality; what makes a "good" TV program?
- Share their judgments with other children and adults including family discussions. Ask students to explain their judgments.

Drama

When viewing dramatic programs together with children:

- Provide clarification for new words; ask them to look up the word.
- As children to recall the order of events in the story.
- Discuss the geographic location of the story and the time period of the story. Find it on a map; discuss the historical period.
- Ask the child to predict what will happen next.
- Encourage children to think of cause and effect within the plot of the story.
- Discuss the motivation of the characters. Discuss conflict in the story, how the conflict was resolved, was it a "satisfying" resolution, and the importance of conflict in a drama.
- Ask children to discuss if they would have behaved the same way or differently if they had been in that situation.
- Suggest books or short stories that have the same plot line or similar characters.

News



When viewing the news with your children:

- Suggest that students compare and categorize different kinds of news, e.g. hard news, features, sports and editorials.
- Have children identify fact or opinion. Identify words, body language, tone of voice, edits or camera movement that indicate personal opinion.
- Ask children to paraphrase or summarize the news story.
- Ask students how they would go about finding additional information that would clarify the story. How would they go about doing research on this story?
- Ask for opinions on a specific story and discuss it; ask the children to play devil's advocate and argue for the opposite side of their beliefs.

- Compare the coverage of the same story on different channels, e.g. C-SPAN, CNN, the evening news for different networks.

- Have children predict how the particular news story will turn out; follow the progression.

Detecting Bias in the News

Several guidelines for detecting bias in the newspapers and television news follows:

1. Bias through selection and omission:

Within a given story, some details can be ignored, others included to give readers or viewers a different opinion about the events reported. Only by comparing news reports from a wide variety of outlets can this type of bias be observed.

2. Bias through placement:

Readers of papers judge first page stories to be more significant than those buried in the back of the newspaper. Similarly, television and radio newscasts run stories that draw ratings first and leave the less significant for later. Exciting or titillating stories serve as "teasers" to keep people watching even after commercials.

3. Bias by headline:

As the most-read part of a newspaper, headlines can convey excitement where little exists as well as express approval or condemnation. Headlines at the beginning of a TV newscast indicates the stories that are deemed important by the news director.

4. Bias by photos, captions and camera angles:

Which photos a newspaper or a television news director chooses to run can influence the public's perception of a person or event. Captions and the narration of TV anchors or reporters are also potential sources of bias.

5. Bias through use of names and titles:

In many places around the world, one person's "terrorist" is another person's "freedom fighter."

6. Bias by choice of words:

The use of positive or negative words with a particular connotation can strongly influence the reader or viewer.

If we as enlightened consumers of visual information can spread the word and if teachers and parents can follow some of these guidelines then we can start to develop a more visually literate society and certainly a society which is capable of thinking critically about what we see in the mass media.

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Digital Chisel: A Visual Multimedia Authoring Tool

by John McCullough and Richard A. Couch

Tool, Tutor and Tutee

Robert Taylor in his book, *The Computer in the School: Tutor, Tool, and Tutee* (1980) proposes that the computer be used in three ways in schools; as a tool, as a tutor and as a tutee. Most schools are using the computer as a tool for both the teacher and the student, e.g. word processors, statistics packages, spreadsheets, databases and draw/paint packages. Some schools are using it as a tutor, e.g. drill and practice, games, tutorials, and simulations, etc. However, very few schools are using the computer as a tutee.

The Computer as Tutee

In describing the role of the computer as a tutee we first have to think about how students learn and what kinds of activities students should perform in order to retain information and learn to think.

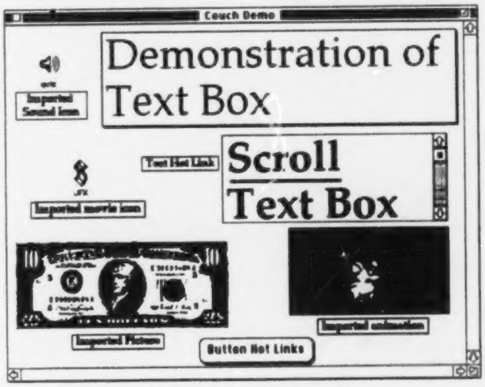
When students are asked to tutor their peers or when they are asked to teach others some information, they learn a great deal. Most often students will learn more by teaching others than if they were sitting and listening to someone else "tell" them. This teaching of others concept is the idea behind the computer as tutee. When we ask a student to teach/tutor/program the computer in order to teach others (their peers, parents, etc.), the student must construct the knowledge in their own mind in a logical and learnable manner or they must do research to find out more about the subject before they present it in a memorable way for others. In order to perform these high level intellectual skills, the programmer must really understand the content they hope to teach. Many of us have experienced this phenomenon in our own teaching. When we start to teach a subject, we spend a great deal of time learning the content, and as we teach the same subject for an extended period of time, we continue to learn even more. Any age or ability level student can teach/tutor the computer if the authoring tools are user-friendly.

The student programmer, obviously, learns more about the content being programmed into the computer than the person who would use the program as a tutorial. *Digital Chisel* is a wonderful, sophisticated yet user-friendly authoring tool for helping students and teachers to tutor/teach the computer, thus allowing them an opportunity for higher level thinking and retention of information. Besides using *Digital Chisel* in the role of tutee, it can also be used by the teacher as a tool to create individual tutorials for students and as a presentation tool to enhance classroom and professional presentations. But we as classroom teachers need to be spending more time allowing and helping our students to construct knowledge. *The Chisel* is a great tool to help us accomplish the above mentioned educational tasks.

Digital Chisel

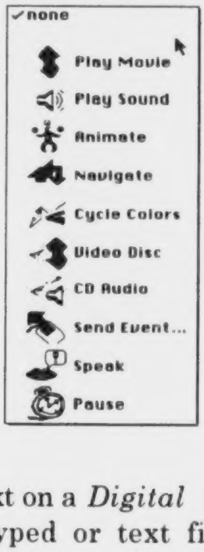
Digital Chisel is an elaborate but simple-to-use visual, multimedia, authoring tool. It was designed by teachers for creating interactive educational presentations. You can design all types of interactive presentations without any knowledge of programming or scripting which is required in HyperCard. These presentations, called projects, consist of a collection of screens. Each screen contains a combination of text, graphics, sounds, animations, and movies. You can create screens from scratch using *Digital Chisel's* basic drawing and painting tools, or you can choose from fifteen ready-made screen templates. The beauty and power of *Digital Chisel* are in the complete flexibility of project design. Instead of a boring, linear, worksheet-like project, *Digital Chisel* encourages advanced, cognitive-web designs. Projects allow users to pursue their thinking. For example, you could create a project for your students that studies animals of the South American jungles. A student could click on a picture of a Jaguar to learn more about it. A box of text would appear presenting factual information about these big cats and where they are found in the world. Then, the student could click on the countries listed to view a map of the world. When satisfied, the user can return to the main part of the project. *Digital Chisel* projects are limited only by the author's imagination.

Figure 1
A sample screen with many objects



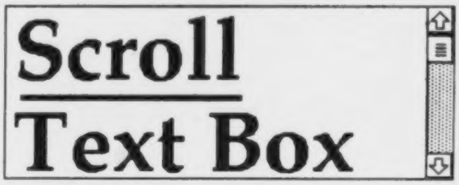
When you create a collection of screens for a project, everything viewed on each screen is called an object (Figure 1). Text, graphics, still frames of movies and small pictures called icons are all considered objects. Each object acts like a button on the screen. You design your project so that clicking on objects on the screen performs a wide variety of *Digital Chisel* events. Each object, when clicked, can be set to play a movie, play a sound, display an animation, navigate to another screen, play a videodisc segment, play an audio CD, send an action to another object, speak a segment of text, or pause for a given period of time. Amazingly, every object in a project can perform one action or as many as 24 separate actions. All this can can be accomplished without any knowledge of programming. Simple, pull-down menus are provided which allow you to define the actions (Figure 2).

Figure 2
Pull-down menus make choosing actions simple



Text on a *Digital Chisel* screen can be typed or text files can be imported from any word processing program. You create a box on the screen called a field and type or import text into it. *Digital Chisel* considers the field as an object, so if a user clicks on the field, any of the previously defined actions can be performed. In addition to considering the entire field as an object, *Digital Chisel* allows you to define any word or sequence of text as a 'hot link' (Figure 3).

Figure 3
Hot links are displayed as underlined words



When a user clicks on the hot link, any of the actions previously described can be performed. Some common uses of hot links are to provide definitions of words or to display a picture, movie, or sound to illustrate a new concept.

The most essential components of a visual, multimedia project are pictures and graphics. *Digital Chisel* can import PICT files, a common file format for many clip art files and graphics created by other drawing applications. However, you are not limited to importing ready-made graphics, you can create your own easily by using *Digital Chisel's* powerful drawing and painting tools. *Digital Chisel* provides line, shape, fill, eraser, text, paintbrush, coloring, and selection tools just like most drawing applications. Once created, just drag your graphic to where you want it on the screen, or copy it and paste it on other screens in your project.

Sounds can be imported from sound-clip files or recorded directly by you. *Digital Chisel* is compatible with AIFF format, one of the most commonly used sound formats. Provided your computer has a microphone, you and your students can record and save voices, sounds, and music. After sounds are saved, they can be played as an action of any object in your *Digital Chisel* project.

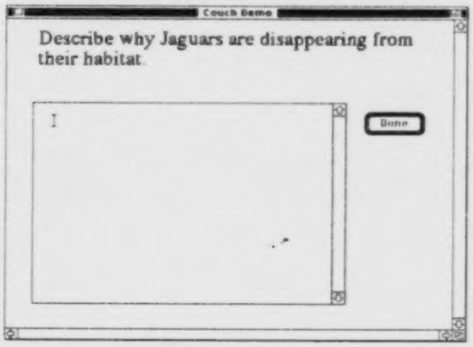
Movies are an excellent multimedia component of any *Digital Chisel* project. *Digital Chisel* can import QuickTime movies from video-clip files. QuickTime is the most common movie format used by personal computers. To watch a movie, a user just clicks on a still frame of the movie, or a small movie icon that has been placed anywhere on the screen. Another possibility is that a user can click some other object on the screen, and the movie will appear and begin to play. When the movie is finished, many options remain. The movie's still frame or icon is just like any other object on a screen, all previously discussed actions can be defined.

Digital Chisel goes beyond providing you with the capability of importing text, sound, graphics, and movies. You can store all these multimedia objects in a media file called a library. The library allows you to view all these files in a small window on the screen. You place any file in your project simply by dragging it from the library to any location on your screen. This feature makes *Digital Chisel* easy enough for anyone to author powerful, visual, interactive .projects without any knowledge of programming.

Multimedia presentations are only the beginning. *Digital Chisel* is also an elaborate testmaker. You can design any screen to be a visual, interactive quiz or test question. Quiz screen templates are provided from *Digital Chisel* pull-down menus. You can choose a ready-made multiple choice, true/false, matching, picture pick, typed response, or essay question quiz screen. You simply make your choice of a template and replace the 'dummy' question and answers with your own. You can still add all the text, graphics, sounds, and movies you want to the quiz screen.

The most powerful feature of quiz screens is the ability to record the user's responses into a database. *Digital Chisel* provides you with several options for creating a response database. Then, when a user runs the project, *Digital Chisel* automatically records into the database whether or not the questions were answered correctly and how long it took to answer the questions. If the question requires a typed response or an essay answer, the student's entire response is recorded in the database for you to view later (Figure 4).

Figure 4
A sample essay question quiz screen



Describe why Jaguars are disappearing from their habitat.

Digital Chisel even calculates the percentage of correct answers. You can view responses and scores just by opening the database. The database can also be exported to a spreadsheet or word processing file for use in letters and reports.

Digital Chisel is an exceptional, award-winning, multimedia authoring tool. MacUser magazine chose *Digital Chisel* as winner of the Tenth Annual Editor's Choice Awards for best multimedia software in 1994. Anyone can use *Digital Chisel's* pull-down menus to simply add text, graphics, animations, sounds, and movies and create a powerful, visual, interactive presentation without any prior knowledge of computer programming. A well-designed user's manual and a CD-ROM packed with libraries, pictures, sounds, and movies make your *Digital Chisel* projects of exceptional quality. Digital Chisel is published by Pierian Springs Software and the authors can attest to the personal responsiveness of the company. We have a lab which is networked and has *At Ease* as a student security and document retrieval system. Because of the *At Ease* software we have had a couple of glitches with *The Chisel* and the Pierian Springs Software has been tremendously cooperative, responsive, and helpful.

As Visual Tutee

Digital Chisel is a multimedia authoring tool that can help educators in many ways. It can be extremely helpful as a visual presentation tool; as a tool to individualize instruction and to keep individual records of student progress; and as a tool to help students learn using a variety of visual and auditory modes. But as a multimedia authoring software, educators need to be using *Digital Chisel* as a way to help motivate students and to help them to construct their own knowledge by teaching others in the tutee mode.

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The Visual Analysis Of Visual Metaphor

Dennis M. Dake and Brian Roberts

Most professional literature on metaphor says that metaphor is primarily a linguistic experience. Current theoretical and experimental models generally break metaphor into separate components, such as vehicle, ground, and subject and then further subdivide it into a large variety of types. (Ortony, 1993, Feinstein 1983, Kennedy 1982)

Even the professional literature on visual metaphor, commonly uses verbal metaphor as its primary evidentiary base and uses analogies to verbal metaphor as its theoretical structure. This current paper presents a more visually based approach to understanding visual metaphor. The methodology suggested in this paper is that of metaphoric analysis and comprehension by graphic and pictorial means. It is the authors' contention that visual metaphor functions more simply and more visually than tje current theoretical models suggest. Yet in spite of this simple structure, the rich nature of perceptual and mental images can provide a multileveled complexity of significant metaphoric meanings.

AMBIGUITY AND THE NATURE OF VISUAL TRUTH

The visible world is forever ambiguous and open to individual, idiosyncratic interpretation. The mental imagery constructed within an individual human brain, from perceptual inputs, is further confounded by individual differences in expectations and prior experience. This subjective, perceptual filter leads to differing, individual conclusions concerning the meaning of all percepts. Does this imply then, that there can be no meaningful visual communication between individuals? If the answer is yes, then the very foundation of visual literacy is called into question.

The contention in this paper is that visual communication does not make its primary contribution to shared human knowledge through literal means and serial causation. It is clear, from both the scientific and artistic evidence, that visual expression is most effective in the area of the metaphoric and multi-leveled, parallel communication of meanings.

BISOCIATION

The perception of meaning in visual metaphor begins with a heightened sensitivity to visual structure. The perceptible qualities of shape, line, form, color, and texture,that make up the unique visual structure characteristic of any particular shape, configuration, or scene, are called physiognomic properties.

Physiognomic properties are perhaps best understood through visual example. The illustration (Figure 1) by Charles Philipon, shows the similarity of physiognomic qualities shared between King Louis Philippe and a common pear. This is a classic example that is often used to illustrate the nature of physiognomic characteristics. So fluid are physiognomic characteristics that they can easily cross categorical boundaries at the expense of common object recognition and culturally approved meanings.

The mixing of physiognomic properties from objects in different categorical matrixes has been called **bisociation** (Koestler, 1964). Koestler coined the term bisociation to differentiate the type of fluid, generative thought we are considering here, from ordinary associational thinking. In his book, The Act of Creation, Koestler demonstrates that bisociation is the foundation for what humans commonly call the act of creation.

Looked at in terms of modern cognitive psychology, bisociation is an exemplar of what neuropsychologists have identified as **"thinking by appearance."** Levy and Trevarthen concluded in their 1976 study that, "The right and left hemispheres are specialized for detecting structural and functional similarities, respectively...". In other words, the left hemisphere makes logical connections between objects based on their ability to fulfill similar functions. The right hemisphere is, to the contrary, specialized for making comparisons based on purely structural appearance. Right hemispheric choices are based on a purely image-based reasoning. To draw upon an individual storehouse of mental images contained in memory involves an act of imagination (image - a - nation: a nation of learned images). The authors suggest that "thinking by appearance" is a vital mental process necessary to create, analyze and understand visual metaphor.

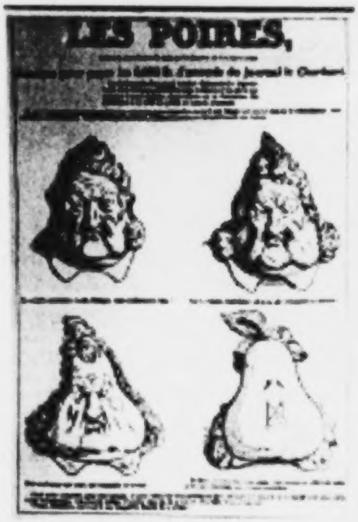


Figure 1: Charles Philipon, Les Poires, 1834

Visual artists have often remarked on the fluid and category-breaking nature of meaning in the visual sphere. Best known for his comments on the subject is Spanish artist Pablo Picasso.

"Reality is more than the thing itself. I look always for the super reality. Reality lies in how you see things. A green parrot is also a green salad and a green parrot. He who makes it only a parrot dimishes its reality. A painter who copies a tree blinds himself to the real tree. I see things otherwise. A palm tree can become a horse." (Pablo Picasso, July 10, 1950 in Sunday Observer)

Combined, physiognomic perception and boundary breaking thinking, through bisociation, form the basis for visual metaphoric communication. Without the rich and multi-layered analogies that are suggested by these two thinking skills, visual meaning is reduced to a low level of literal illustration.

A PLAYFUL GAME TO UNEARTH MULTIPLE MEANINGS

The remainder of this paper will report, in largely visual form, the results of a workshop held at the 27th annual convention of the International Visual Literacy Association, in Chicago, Illinois, on October 18, 1995. Rather than present a further written explanation of visual metaphor it was the decision of the authors to demonstrate, in visual practice, the efficacy of the visual analysis of visual metaphor.

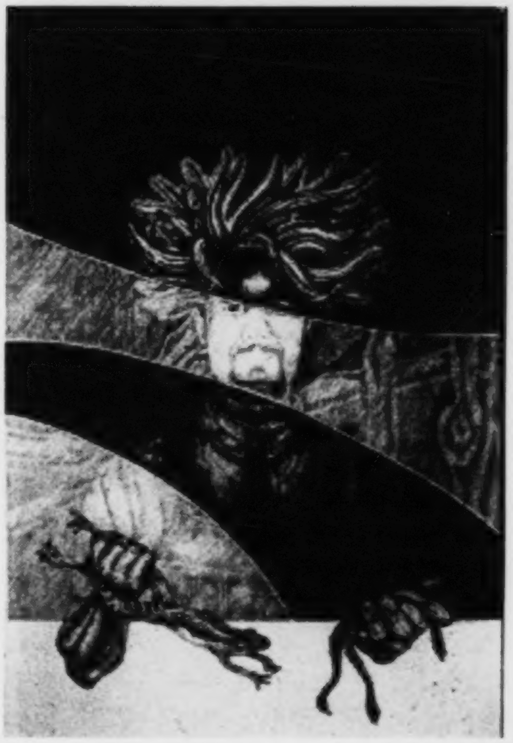
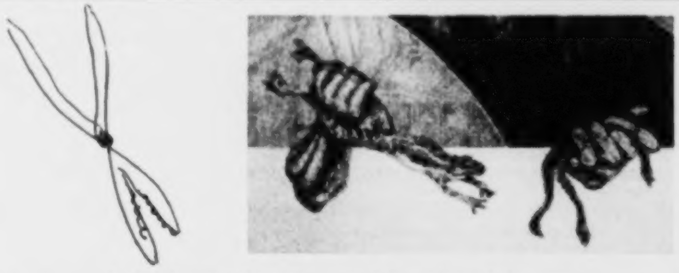


Figure 2: Brian Roberts, 183 Days, Pencil on Paper

PARTICIPANTS: Sixteen adult participants self-selected to attend this workshop entitled, "The Visual Analysis of Visual Metaphor." It was assumed that attendance indicated a positive attitudinal mindset toward the subjects of visual metaphor and visual analysis. The participants were members of the International Visual Literacy Association with intense professional interests in matters visual and educational. Thirteen of the participants were female and 3 male. They ranged in approximate age from 30 to 70 years of age. They came from a wide range of professional, visually related, disciplines.

PRIOR ANALYSIS OF THE VISUAL METAPHOR: A self-portrait pencil drawing, entitled, "183 days." (FIGURE # 2)



A visual comparison discovered through workshop game.

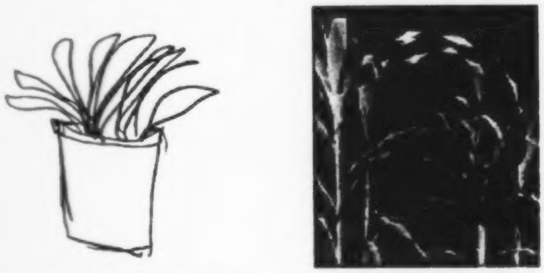
created by one of the authors, Brian Roberts, was selected as the visual metaphor for analysis. This highly symbolic visual art work is the result of much disciplined visual thinking through disciplined sketch pages (some of which are reproduce here). These thoughtful pages show a careful and creative evolution of many levels of meaning. The intended and discovered meanings were carefully analyzed, prior to the workshop so that they could be compared with meanings discovered subsequently by the workshop participants.

WORKSHOP ACTIVITIES: The workshop focused on playing a visual game, **Bisociative Pictionary,** based on the current commercial game, Pictionary. This game allowed participants to visually discover bisociations in the drawing, "183 Days," without excessive verbalization.

The participants were divided into teams of four members each and encouraged, through free association, to find as many bisociations as they possibly could within a 30 minute game period. No verbal clues were to be given to other team members about the bisociations individuals saw. Only graphic, drawn responses were allowed for communication. A bisociation could only be confirmed when another member of a team guessed the name of the object or activity being drawn. When a successful match was confirmed, it was added to a stack of correct matches for that group. At the conclusion of the 30 minute round each team totaled up their confirmed responses and the team with the most non-duplicated responses was declared the winner. (The winning team in this particular contest had 83 confirmed matches.)

Figure 3: Workshop participants sorting drawings into categorical themes and taping in groups on the wall.

To determine the possible meaning behind these bisociations, the winning team was then asked to analyze its stack of drawn responses for categorical patterns. Drawings in each categorical grouping were taped to a wall and labeled with titles suggested by participants. The other workshop teams were then encouraged to contribute their drawings to these visual categories and then to create additional thematic groupings from their remaining stacks of bisociative drawings.



A visual comparison discovered through workshop game.

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Chart # 1 shows the quantitative results of this classifying activity, condensing all drawings into 12 categories. Only after the conclusion of this pattern seeking activity were the participants shown a slide show version of the artist's analysis of levels of meaning.

Chart # 1

Categorization of Bisociative Drawings by Workshop Participants

CATEGORY	NO.	2ND CATEGORY
NATURE	40	2
TOOLS	27	8
PEOPLES ROLES	23	2
ENTERTAINMENT	22	3
FOOD	18	8
MYTHOLOGY	16	5
ANIMALS	15	6
CLOTHS	14	2
MAN MADE OBJECTS	12	3
EROTIC	9	2
PEOPLE IN ART	6	3
MISC.	4	0

The initial categorizing exercise resulted in the discovery, by workshop participants, of three of the six predetermined levels of meaning. Because many of participants' drawings could also fit in more than one category and many drawings suggested knowledge of other levels of intended meaning, the researchers concluded that they should conduct their own critical visual analysis of all workshop drawings.

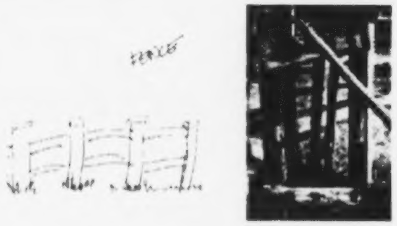
Chart # 2

Comparison: Workshop Drawings Distribution and Predetermined Levels of Meaning

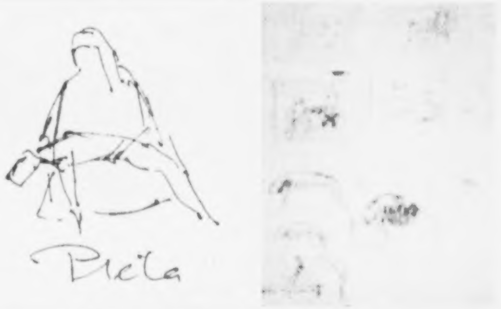
	Original Matches Participants	Critical Analysis Authors
LITERAL	0	2
MULTIPLE ROLES	23	20
NATURE AND EARTH	40	43
EROTIC	9	12
METAMORPHOSIS	0	5
UNIVERSAL	0	5

As shown in Chart # 2, this critical redistribution resulted in a pattern of, what seems to the authors, clear visual matches in all 6 predetermined areas of meaning. These visual patterns seem to indicate that a purely visual game, such as bisociative pictionary can help individuals discover multiple levels of shared visual meaning.

To help the reader judge the nature of visual pattern correlations, selected participant drawings are shown in the following section, matched on the opposite page to the levels of meaning predetermined by the artist.

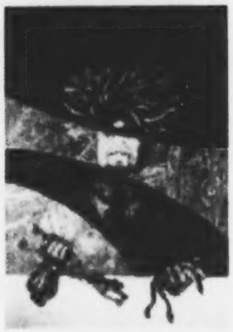


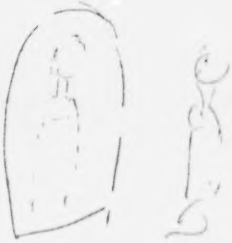
Some addditional visual comparison discovered through workshop game.

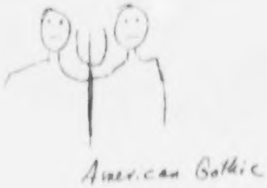


Visual Analysis by Workshop Participants

Level 1: Literal

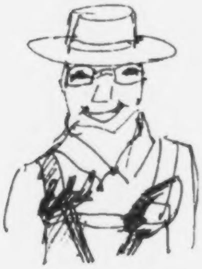


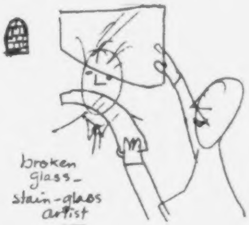


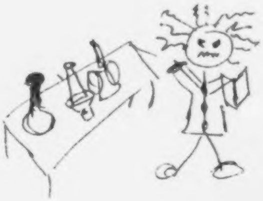


Participants had the literal image before them throughout the workshop game. A person viewing himself in a mirror and the Iowa farm-based image of "American Gothic" are particularly strong visual connections with the artist's rural life.

Level 2: Multiple Roles

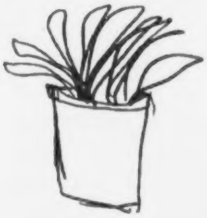


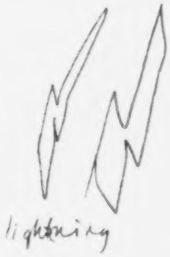


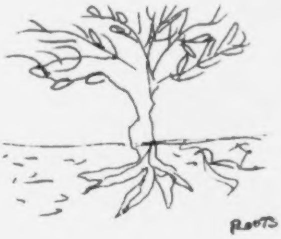


Among the many roles present in the artist's life and visually identified by the workshop participants were: farmer, glass artist, and teacher/presenter.

Level 3: Nature and the Earth







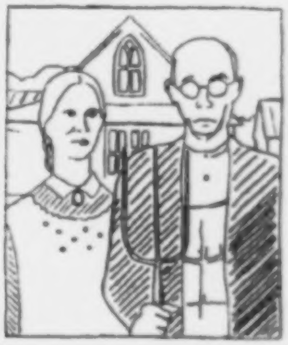
The fertile earth, from which plants draw their nourishment, and the forces of weather that interact with growing things, were correctly analyzed from visual clues alone.

Predetermined Visual Analysis by Authors

Level 1: Literal

The literal level of meaning is that "183 Days" is a self-portrait of the artist.

The self-portrait was developed from the photo of a farmer presenting an ear of corn.



American Gothic done by Iowa artist, Grant Wood, a historical connection to the presentation of a farmer wearing bibs.

Level 2: Multiple Roles

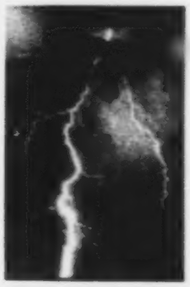
The future art teacher utilizes many tools for demonstrating to a class.

The forms of an original glass vase show the glassblower's role.

Grandfather, father, son: the farmer's role is maintained from generation to generation.

Level 3: Nature and the Earth

Connections to soil where life begins and also ends.

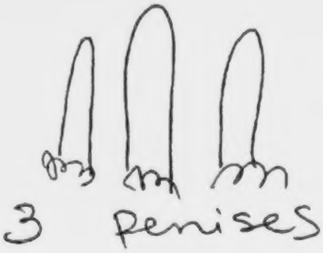


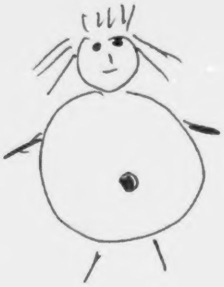
Nature also has its destructive side such as lightning.

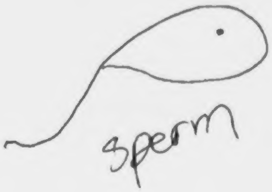
A corn plant establishes roots to gather nourishment.

Visual Analysis by Workshop Participants

Level 4: Erotic / Fertility

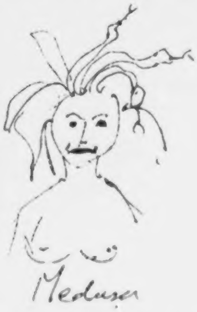


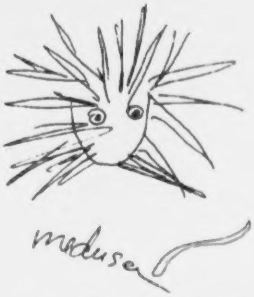


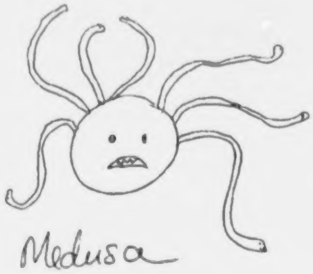


Eroticism and fertility were major themes explored by the artist in the visual thinking that led to the drawing, "183 Days". Several of the teams of workshop participants correctly detected and visually expressed awareness of this theme.

Level 5: Metamorphosis

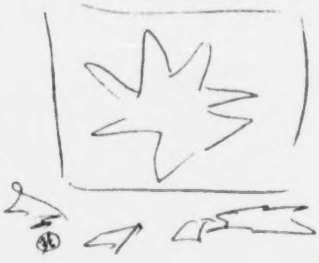


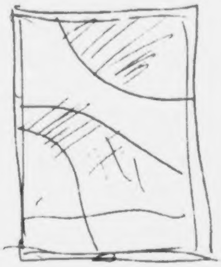


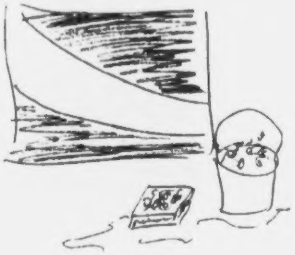


The mythical figure of the medusa, a symbol of transformation and change, was a common subject drawn by workshop participants. It corresponds to the many changes currently occurring in the artist's life.

Level 6: Universal



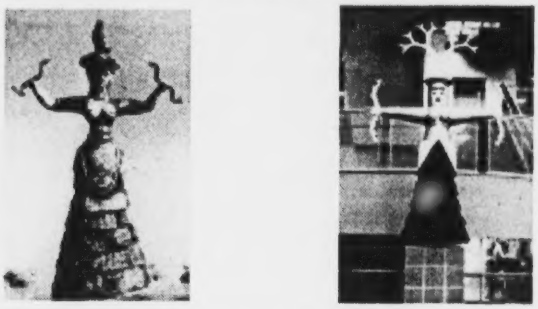




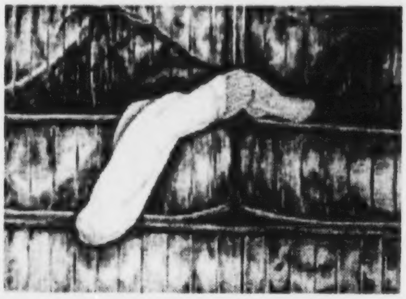
The shattering of the plane of glass in a window is a theme that corresponds to current postmodern thought, which moves beyond detached observation of nature from a single, static vantage point, projected on a transparent picture plane.

Predetermined Visual Analysis by Authors

Level 4: Erotic / Fertility

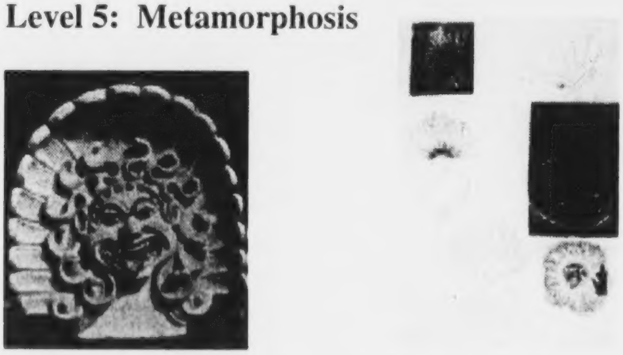


Serpent Goddess (16th c. B.C.E,. Crete) and modern sculpture, Forbidden Fruit, (Andrew Leicester, 1991) are fertility symbols bearing offerings; one offers snakes and the other DNA strands for genetic engineering.

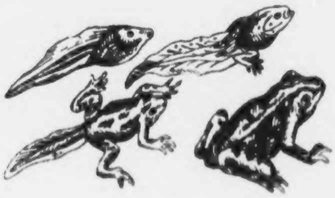


In an original preparatory drawing, the artist explores the theme of 'the denial of erotic potential.

Level 5: Metamorphosis

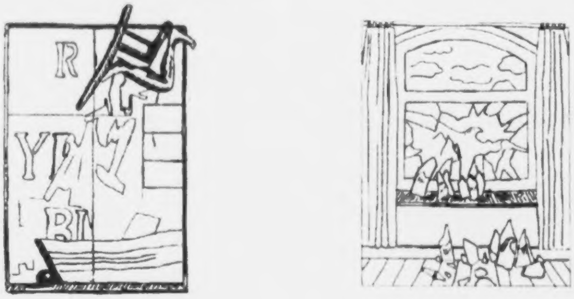


Sketches focus on the transformations occurring internally and externally to the artist. As with the Medusa, many transformations and changes are occurring.



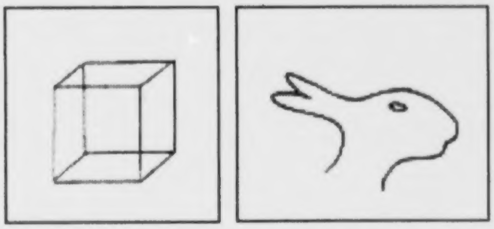
Just as frogs mature through different stages of life, the artist is growing through different development stages.

Level 6: Universal



Paintings by Jasper Johns and Rene Magritte demonstrate the breaking of the Renaissance "window on the world," complications not easily unified into a single perspective.

Artist explores lack of harmony in the world by breaking the picture plane.



Figures 4 & 5: Necker Cube and Duck/Rabbit reversible figures.

MULTIPLE LEVELS OF MEANING

It was the general conclusion of workshop participants that they had discovered a number of noticeable visual correspondences of meaning, with the artist's intended levels of meaning. The authors agree. This agreement conforms with the idea that visual forms communicate multiple levels of meaning. The visual patterns just presented demonstrate that these meaningful connections can be understood by purely visual analysis. This brings up the question of how multiple levels of meaning can be simultaneously embodied in specific visual forms?

RECONSTRUALS

A possible cognitive basis for thinking by appearance has been suggested by psychologist Mary Peterson with the concept of **reconstrual of imagery.** Rather than simple visual recognition Peterson suggests that, in perception, "there exists a stage in which a structural description of a shape is not connected to an interpretation." (Peterson 1993) At this stage there appears to be a rapid search through an imagistic lexicon for the best possible match.

Reversible illusions, such as the Necker Cube (Figure # 4) and the duck/rabbit form, (Figure # 5) show this flexible mental ability to make multiple decisions about a single form. It is the Elephant/snail illusion, shown in Figure 6, however, which best illustrates the ability of the brain to provide multiple, meaningful alternatives without a shift in the reference frame of the viewer.

In the Elephant/snail illusion there is no swapping of the left for the right side, figure for ground, or top for bottom. The viewer's reference frame remains the same in relationship to this single form and yet it alternates between elephant and snail. This suggests that every shape or form in the visible world can be a trigger for multiple bisociations. Many associated meanings are carried along with the each of these matches. This looser categorical thinking is what some have called, remote analogies. From remote analogies multiple meaningful associations, are indeed possible.

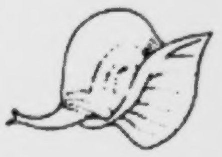


Figure 6: Elephant/snail reconstrual figure.

MEANING AS TRANSACTIONS WITH THE ENVIRONMENT

Visually based meaning is not something to be found in the exterior object but something each observer constructs internally. Multiple levels of meaning poetically arise out of the nature of these multiple individual transactions with the visible object. Meaning within visual literacy requires **response-ability** from the individual doing the creative seeing.

It is this paper's primary conclusion that multilevel visual meaning is foundational to both visual literacy and visual creativity. Conceptual boundary breaking and multi leveled perception are necessary mental skills in all areas of productive human life. Perceiving multiple levels of meaning requires a shift from mechanical and static labeling to a dynamic, relational, contextual, and process oriented type of thinking. Logical reasoning in verbal terms is not, in this case, the best laboratory for the understanding meaningful patterns. Arthur Koestler suggests the real basis for understanding the discovery of visual meaning.

"The mind is insatiable for meaning, drawn from, or projected into the world of appearances, for unearthing hidden analogies which connect the unknown with the familiar, and show the familiar in an unexpected light. It weaves the raw material of experience into patterns, and connects them with other patterns....." (Koestler, 1975, page 390)

Searching for meaningful visual patterns through bisociation, thinking by appearance, and reconstrual are vital skills leading to visual literacy. As shown in the previous analysis of visual metaphor, the patterns and themes that are discovered from thinking this visual way, can cumulatively reveal patterns of multiple poetic meanings.

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Scientific Thinking Is In The Mind's Eye

Indrani Ganguly

Introduction

The National Science Education Standards (1993) recommended the inquiry approach of studying science. It was believed that the use of this approach will make science instruction consistent with the practice of science. Science can no longer be regarded as a body of unalterable truths, or of logical procedures, routinely and dispassionately applied to objective observations and numerical. Teaching authentic science presents science as a human enterprise, where the scientists' personal motivations, private intellectual activity, and their methods of solving problems are consolidated. Unfortunately, very few research studies (only about 10 of two hundred seventy five), have cast light on the above epistemology of science (Finley et al., 1992).

Visualization of scientific phenomena has been a key premise for thinking with several of the renowned scientists. Maxwell's visual-spatial thinking dominated his scientific accomplishments in the study of color and light. Faraday, driven by a strong imagination, created fiercely original mental models on electromagnetism and lines of force. Bohr's development of quantum theory, as well as Einstein's abstract scientific theories, would not exist had it not been for their fluid visual thinking. The habits of thinking used by the eminent scientists need to be taught to students through instructional interventions to attune them with the nature of science. Thus, authentic science teaching calls for the infusion of thinking skills instruction into daily lessons.

Mental models (Greeno, 1984) offer a systematic representation of the thinking pattern that is essential for a novice learner in transferring knowledge from a familiar to an unfamiliar domain. Mental models are built from personal interpretation of information. Hence, teachers need to be cognizant of the students' preconceptions of scientific ideas. Employing visual information to model a system's structure and inherent causal relationships is vital to invoking systematic thinking in students. However, the analogies, the mental models and any other visual information need not aim at a single deterministic immutable view. Rather, they can use a systematic thought pattern by which students learn the various facets of authentic science.

Visual thinking is a key tenet of scientific thinking. The rendition of science teaching needs to implicate the visual thinking strategies to insure a conceptual understanding of science that relates the natural world to the students' existing schema. Starting from the belief of Pestalozzi that all understanding is rooted in visual thinking, the theories of Arnheim (1986), Paivio (1986), and Gardner (1983) on mental imagery and spatial intelligence, reveal the effectiveness of teaching through representational aids in knowledge organization and integration. Mental models can provide a view of mind, meaning and method that could broaden the ways in which we think about science as inquiry.

Habits of Scientific Minds

Sir Peter Medawar, in Advice to a Young Scientist dismisses the notion that scientific discoveries are made by "just looking around."

> .....I think that Pasteur and Fontelle would have agreed that the mind must already be on the right wavelength ....that all such discoveries begin as covert hypotheses - that as imaginative preconceptions or expectations about the natural world and never merely by passive assimilation of the evidence of the senses.... The truth is not in nature to declare itself. Every discovery, every enlargement of the understanding begins as an imaginative preconception of what the truth might be.

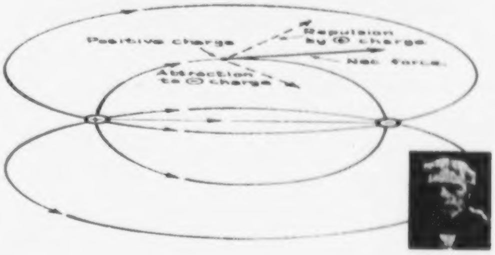
Science deals with aspects of life that we often cannot see literally. Hence imagination and perception play vital roles in pursuing this inquiry process. Scientists "see" by gathering data, measuring, making assumptions and forming tentative conclusions. Sometimes what can be perceived through our imagination cannot be at once perceived through human sensory organs. For instance, the wave nature and particle nature of light have been established through two distinct perspectives. Perception is an active process. We go out and get it. Individual perceptions are often tainted by cultural biases and expectations so much so that they fail to see beyond their realm of familiarity. Thus, the truth often gets lost because of our habitual propensity to place boundaries between ideas or concepts. In an effort to visualize something that is unseen, scientists have often resorted to metaphors to build up their thought processes.

Metaphors

Metaphors, like perceptions, are drawn from common experiences. Black (1977) called a metaphor the "tip of a submerged system of ideas." Often it is not clear what the notion of the metaphor includes and excludes. A metaphor incurs some sense of distance from ordinary language. The history of science is replete with the visions of those scientists who have reformulated problematic concepts through metaphors (Rothbart, 1984; Cole, 1985). For example, "light waves" do not undulate through space as water waves ripple over a still pond, an atom does not really "leap" from one quantum state to another, a "field" is not like a hay meadow, and electrons do not really travel around the atomic nucleus in circles any more than love produces literal heartaches. Metaphors are a means to anchor scientists' thought processes in generating a pattern that would thematically bridge the gap between the seen and the unseen. Jansen (1989) says, "metaphors are apprehended by the human eye, formed by the human tongue, tuned to the human ear and comprehended by the human brain." In different ages, scientists projected different perspectives in describing the same entity through their minds' eye. Their viewpoints were tainted by the sociocultural mores of their individual context and space. Thus, the metaphorical descriptors for the same natural world was once "a mother", a "world machine", synonymous with body/nature/matter/a female persona; "God's great pregnant automaton", in this century, an object that could be penetrated by nuclear bombs (as would pregnant phallus) and be overpowered.. What something means to an individual belonging to a certain time and culture cannot be fully deciphered by those in different circumstances. Since metaphors are rooted in their experiential basis, they are a subjective proposition (Lakoff & Johnson, 1980). Moreover, since science is not a fixed system of non-negotiable theories and concepts, these multiple metaphorical perspectives of the scientists will do well to enable students acknowledge the true nature of science.

But the most unsettling thing is that the science that is dealt out in the classroom is far from what science is in its entirety. Teachers, anxious about covering the syllabus within a stipulated time frame, often introduce students to only one aspect of the scientific enterprise, namely the public science. Public science is a contingent plane of empirical facts and analytical relevance. The level of specificity and exactness that forms the key premise of public science is sufficient to debar any student to question any of those scientific propositions. Thus, a student who is not given a chance to reorder information, to alter existing categories, or to see new gestalts cannot be said to be participating in a learning activity. Holton (1973) emphasized that private science, which is a private struggle of scientists and their imaginative processes should be shared and kept in view in order to cohere and ignite scientific efforts. Factors such as emotional, aesthetic and social forces intrinsic to scientific inquiry need to be referred to when delivering science lessons. For instance, the British physicist, Michael Faraday, who earned the reputation of being the world's greatest experimenter, was thrown into a terrible discomfort when he could not visualize electric and magnetic forces in terms of "action at a distance." Faraday grew desperate over his inability to project something that would portray his imaginative vision of lines of force and then eventually came up with a graphical method for representing those forces (as shown in Figure 1).

Figure 1
Faraday and the Concept of Field



Faraday's imaginary lines of force associated with magnets and current-carrying wires existed in space whether there were other interacting bodies or not. As his research progressed, he increasingly rejected the idea of "action at a distance", as earlier proposed by Newton (Stockmayer & Treagust, 1994). The lines represented the force in two ways: the direction of the force at any point in space was along the lines, and the strength of the force was greatest where the lines were closely spaced. Faraday's graphical model of lines of forces was later termed as the "field" that

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permeated all space.

Metaphors (visual and verbal) that relate to the emotional, aesthetic and social forces of scientific inquiry are instrumental for teaching the epistemology of science. Students need to acknowledge that science is not all worked out, but is an open-ended inquiry process. Just as Faraday's visualization of electromagnetic effects shifted the focus from Newton's theory of action of a charge at a distance, scientific knowledge has forever been shifting focus from one concept/theory to the next; contradicting, modifying and charging ahead with newer convictions and glory. This does not mean that new theories have always replaced the old, or that one is right and the other is wrong. It just means that the new theory/perspective allows a better view of the physical phenomena - just like climbing a higher tower to see things better. Authentic science teaching permits flexibility and encourages students to think by means of visual aids like metaphors that allow accretion of knowledge by striking a thematic balance between the known and the unknown. Muscari (1988) however, cautions that both teachers and students of science must realize that once the insight has been achieved through metaphorical visualization, the hold on imagery must gradually be released.

Analogies

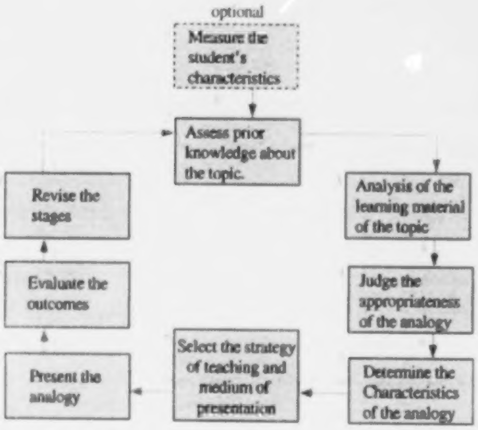
Both scientists in the academic societies and teachers in the classroom engage in acts of persuasion with words and visuals to create a new community of thought. When science teaching merely dwells on the factual description of events rather than an interpretive one, teaching becomes less persuasive in character. Some pupils may never discern the interpretive voice of the scientist and fail to see the more human aspects of the scientific epistemology. Using analogy is another way to lead the pupil's mind through an interpretive system. In the words of Faraday:

> You can hardly imagine how I am struggling to exert my poetical ideas just now for the discovery of analogies and remote figures respecting the earth, sun, and all sorts of things - for I think that is the true way (corrected by judgment) to work out a discovery (cited in Sutton, 1993; Michael Faraday, 1845, in a letter to C.F. Schoenbein).

Scientists have time and again used analogies to discover new laws or theories to explain natural phenomena. Huygens used water wave motion to understand light phenomena (Duit, 1991), Kepler developed his concept of planetary motion from the workings of a clock (Bronowski, 1973) and Maxwell mathematically explained Faraday's electric lines of force (Gee, 1978). These habits of scientific minds can be transferred to students of all levels to ensure that the learner's mental imagery is concrete. Once the student derives a clear idea of the base and target concepts, and their attributes, knowledge acquisition can proceed in a more systematic and meaningful pattern.

Teaching by analogy can be an effective approach in science. Analogies and metaphors are viewed as close relatives. While metaphors compare implicitly, analogies compare explicitly the structure of two domains. According to Brown (1993), students exhibit different conceptual levels: verbal-symbolic knowledge, conscious models, implicit models and core intuitions. Core intuitions are automatically employed and are domain general. These pose the maximum resistance to the acquisition of new knowledge. Analogies can aid in constructing new conscious models, enabling the refocusing of core intuitions. Zeitoun (1984) proposed the General Model of Analogy Teaching (GMAT) to promote accretion and tuning or schema evolution in learners (as shown in Figure 2).

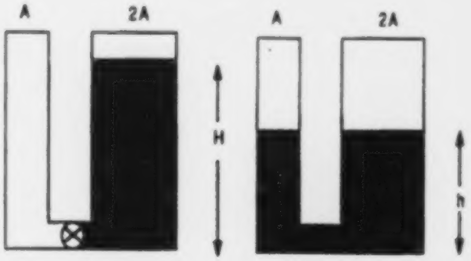
Figure 2
General Model of Analogy Teaching


optional
Measure the student's characteristics
Assess prior knowledge about the topic.
Analysis of the learning material of the topic
Judge the appropriateness of the analogy
Determine the Characteristics of the analogy
Select the strategy of teaching and medium of presentation
Present the analogy
Evaluate the outcomes
Revise the stages

To date there is little research evidence regarding teachers' use of analogies in the classroom (Treagust et al. 1989). However, the qualitative case study reported by Harrison and Treagust (1993), where 12 different analogies were used by six teachers engaged in teaching high school science, shows considerable success in learning by analogy. One such analog (visual illustration) was a pair of wheels rolling from a hard surface onto a soft surface to relate to the target concept of refraction of light from air into glass. The lesson consisted of the following stages: 1.Introduce the target concept to be learned, 2. Cue the student's memory to the analogous situation, 3. Identify the relevant features of the analog, 4. Map the similarities between the analog and the target concepts and 5. Identify the comparisons for which the analog breaks down. The analysis of interview data showed that the students' understanding of the concepts measured up to the expectations of the teacher, and the students derived immense satisfaction out of the lesson.

Another popular use of analogy is the use of fluid theory to explain the flow of electricity in physics. This model was first proposed in the eighteenth century and has stood the test of time. One such application of this water analog of electricity showed how a teacher utilized it in teaching college physics (Newburgh, 1993). In Figure 3, two cylinders of different volumes are connected by a stopcock. Water is contained in one cylinder only. In the next situation, the stopcock is opened and water is allowed to flow until the level of water is same in both cylinders. The target concept for the lesson was Kirchoff's potential law: when a capacitor having charge Q, capacitance C_1, and voltage V, is connected to a second capacitor with capacitance C_2, then the voltage across them will be the

Figure 3
Kirchoff's Law



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same and the sum of their charges will be equal to the initial charge Q. It is clear from the water in the two cylinders having cross-section A and 2A, that the potential energy of water in the two cylinders would be different (M_L gh/2, and $M_R$gh/2). Since the masses of water in the two cylinders are in the ratio of 2:1, the potential energies will also be in the same ratio. Here the equality is not of potential energy but of potential energy per unit mass (gh/2).

The above analogy is an example of comparing and contrasting the two domains of base and target through semantic and structural correspondences. Thagard (1992) showed how the strengths of good analogies can be understood in terms of pragmatic, semantic and structural constraints. However, one needs to remember that in cross-domain analogies, there may be a tension created between the pragmatic constraint and the semantic and structural constraints. As in the above example, the notion of correspondence was the question of equality (not of potential energy, but of potential energy per unit mass). Further in the case of the analog water, there was one kind of mass only, as opposed to two kinds of charge. Hence, an analogy should not be mistaken for a one-to-one correspondence.

One recent study on the use of analogies in high school chemistry offers useful guidelines for science teachers (Thiele & Treagust, 1994). The implications of this research related to:
1. the need to develop a personal repertoire of useful analogies, 2. the necessity to select analogies that can relate to students' existing schema and 3. the importance of explicitly mapping the attributes between the source and the target. The teachers in this study varied considerably in the extent to which they mapped the similarities and dissimilarities between the target and the analog. Also, there was little evidence that the teachers preplanned their analogies. They all agreed that they mentally maintained a working repertoire of analogies which was built up on the basis of their experiences. With regard to the nature of the analogies used in the study, nineteen of the 45 analogies were pictorial. The fact that teacher generated analogies were drawn more frequently than those from students' experiences suggests that the students could be unfamiliar with some of the analogs and failed to make the correct connections. Since most teachers (84%), offered some explanation of the analogs, the original unfamiliarity among students was considerably reduced.

The above findings brings us directly into the question of what factors would make students more competent in making the visual connections required in an effort of analogy transfer. Students should be able to match learned visual structures to new information. Additionally, students should develop a habitual tendency to use visuals to understand abstractions in science, even if they are not prompted to do so. Research has shown that without direction and training students were not likely to use any of the general methods of visualization, such as analogies, concept maps or illustrations (Detterman, 1993; Sweller, 1990). Symbolic visualizations or mental models which do not resemble their referents but merely suggests structure can influence the learner's cognitive structuring skills (Novick, 1990; Schwartz, 1993). Cartesian graphs, Venn diagrams, trees and tables offer the pathway to reveal structural analogies to students. Schwartz (1993) conducted research on the above notion of visual formalism which persuaded students

to make cognitive transfers from a known to an unknown domain, provided the topical information had the same structure. The study reported the following conclusions:
1. grade level emerged as a single determining factor that high school students (9-10 grades) were more likely to use path diagrams than middle school students (grade 7), 2. the latter used original visualizations or alphabetical indexing and 3. about 66% of the student generated visuals belonged to all three categories. These categories were: a) directional properties, b) one-to-many relations, and c) many-to-one relationships through letter indexing or path diagrams. Although the study had limited grade level range (7th, and 9th/10th graders), its insights are valuable for guiding future research in determining students' propensity to use visuals in effecting cognitive transfer.

A word of caution that must be mentioned here is that learners rarely come up with the same precise and compelling comparisons or analogies as mature adults. Students' conceptions usually have a limited range (Duit, 1991). The matter of relating something as akin to something else is contingent upon how quickly and effectively, based on ones experience, one can make a connection between the base and the target domain. Inquiry strategies in science teaching are intended to make students equal players. Probing the effectiveness of the relational structure through visual recourse gives teachers a chance to respect the open-endedness of science as a process, at the same time the science content is safeguarded so that the topic will also be covered. Teachers could meet with some difficulties here. For example, the metaphor uttered by a child (ten years old): "clouds are sponges" may not be the best simile in the world to relate their physical attributes together. It is up to the teacher to probe similarities as well as dissimilarities and to make the child aware of these at his/her level (in this case, formal operational). The degree to which a child remains committed to his comparison is termed by Black as the "emphasis" of the metaphor. How well the comparison communicates what the child believes about clouds is termed the "resonance" of the metaphor (cited in Flick, 1991). The teacher should not ignore the child's personal imagination and inquiry, for it may alienate the child from the scientific quest. It is true that the emphasis and the resonance of the metaphor could alter the contour of the lesson flow that would be necessary to summarize the topic, but it is still worth the trouble. Perhaps the non-conformity of the analogy or the metaphor to the concept at hand could be utilized to eradicate the misconceptions in the student's mind while reinforcing the current topic. Strategies of cognitive conflict (Driver & Erickson, 1983; Stavy, 1991) can remedy these misconceptions provided the students are able to "see" the conflict. The choice of anchoring examples is crucial in this approach. Care needs to be taken that analogical models are not pushed too far or employed in contexts for which they are inappropriate.

Conclusion

Science education researchers have long labored over various folds of science teaching such as, development of curricula, assessment techniques, instructional strategies and teacher education programs. But relative to these areas, they have expended little effort to determine what counts as "authentic science." Part of the problem could be that epistemic science scans three distinct positions of presuppositionism, falsificationism, and personal hedonism. All have been validated by scientists at different points in time, leaving educators in a quandary when making definitive statements on the true nature of science (Finley et al, 1992). However, if we are not imprisoned by prejudices such as, only a scant few of our students will embark on scientific careers and that science is not meant for the ordinary, then we stand a good chance of finding a clear direction.

Significant benefits can accrue both conceptually and practically if we treat scientific thinking not as a rarefied form of thought but as something that could be brought to the realm of the ordinary. It should be clear from my earlier citations that science presupposes some degree of visualization and imagination. If a student is unable to "see" what the concept is about or how to get closer to it by making parallel connections with something already known, the curriculum, problem-solving and evaluation strategies will be of no avail. The thinking of professional scientists who advance scientific thought and theories develops out of the intuitive scientific thinking of children (Kuhn, 1993). It is up to us to break loose from the deterministic approach of public science employed in classrooms and to introduce students to those aspects of private science that will help them understand the lie of the land.

It has been said (Parvanno, 1990):

> Children are born scientists. From the first ball they send flying to the ant they watch carrying a crumb, children use science's tools - enthusiasm, hypothesis, tests, conclusions - to uncover the world's mysteries. But somehow students seem to lose what came naturally.

I take the aforementioned statement as rhetoric and even an overstatement. I argue that to be able to imagine, explore, observe, reason, experiment and problem solve, one first needs to be emotionally bonded with the culture of the academic domain, and this is hardly possible if we give no place to private science in the classroom.

Scientific discoveries are not made just by looking around. Visualization is the mainstay for developing scientific thinking among learners. It should be noted that visualization refers to the cognitive functions of visual perception. It is not merely the physical raw material of vision, but images thoroughly processed by the cognitive powers of the brain (Arnheim, 1991). Metaphors, analogies and mental models are indispensable tools in visualizing abstract concepts of science. Metaphors and analogies have brought closer the two disparate fields of science and literature through the repeated attempts of scientists to place their abstractions in a public forum. Now it is time for us to realize where to put our emphasis on - get our students busy with problem solving or to empower them with the thinking skills of visualization, a mental crutch, that so tacitly adds a human dimension to the scientific quest.

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The ABC's Of Screen Design: What Teachers Should Know To Teach Students To Author In Hypermedia

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Teachers bring varied levels of computer expertise and different purposes when they first begin to use a hypermedia application. Some come with the idea that they will learn to design instructional projects for use with their students. Others are more interested in helping students create hypermedia projects through which they can share new knowledge. No matter what the goal, there are certain design considerations that need to be in place as one continues through the project planning and implementation process.

For the purpose of this paper the alphabet is used as the framework for identifying key issues, ideas, and factors we believe should be considered in the planning and implementation process. We have chosen to introduce these terms as they are introduced in our discussion of teaching multimedia skills, rather than in alphabetical order. For easy identification the terms are boldfaces when used in the text. The complete alphabetical listing can be found following the text.

BACKGROUND

Our field has been supported through the years by the research of instructional designers, many of whom are IVLA members. It is important to note that much of their research has provided a knowledge base for instructional design as their findings are used with students and throughout the industry today. Who has not learned to consider the audience before preparing a lesson, a book, a lecture, or an IVLA presentation? The literature on instructional design guides us as we look at the steps in the design process.

It is important to remember that we use instructional design to help a learner gain the most they can from a new body of **knowledge**. The issues of good instructional design which are used in planning a lesson preceded the use of computers in the classroom. We have taken what is known about designing good instruction and added to it what we have learned about the power of the visual. With time there has been a growing awareness of the importance of using good visual design, a blend of the earlier literature and experiences of today.

What makes some people learn best when a visual component is present? When we blend the attributes of what we know about good instruction and what we know about good visuals then we are aiming to provide well-designed computer instruction. The rapidly expanding technology challenges us to make use of what we know and reshape it to take advantage of these new opportunities being offered to learners today.

Newest technological advances give the classrooms tools to create multimedia productions with greater ease than was possible before. Publishers of authoring software have considered these new users by creating programs that make it easy for teachers and students to produce hypermedia lessons and reports. More powerful programs exist to create business training software but our interest is in those programs that support students and teachers in the K-12 environment. This includes such software as HyperStudio for the AppleIIGS, the Macintosh and Windows, HyperCard and Digital Chisel for the Macintosh, LinkWay Live for DOS machines and MultiMedia Scrapbook and SuperLink for Windows.

DESIGN ISSUES

We've identified some of the elements that are important for teachers and students in developing hypermedia projects. We have used the alphabet as a way of communicating what is important in talking about the design of hypermedia. Although there are many different aspects of hypermedia that come to mind as you take a letter, we have chosen and explained those that have had meaning for us as we teach students how to use hypermedia as a tool in creating projects. We spend a lot of time teaching children the grammar of how to speak and how to write. We have reached a time when it is important to teach our students the grammar of visual communication.

A	B	C	D	E
F	G	H	I	J

A B C's of Screen Design

K	L	M	N	O
P	Q	R	S	T
U	V	W	X-Y	Z

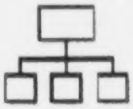
It is the students who are our concern, whether they are in primary school or at the graduate level. Teachers develop instruction plans for their classrooms. It is just as important to have an instructional plan when developing hypermedia projects. **Planning** is a unique process as it is made up of many variables. One of the first considerations is the classroom of students or the group who will become the **audience** or users. Who are they? What age and gender are they? What ability level, interests, and needs do they have? Some developers use surveys or interviews to find out about their intended users but a teacher has the unique opportunity to learn about his/her audience due to the amount of time spent with them and the records available. When students are to develop their own projects, they, too, must consider the users or audience. Will their project be used with their own class, a younger grade, or a broader audience such as parents or the community? Students can also interview and observe the group for whom they are planning the project. Brainstorming a set of questions to provide the information they are seeking should precede talking to their users.

Once the audience is chosen, it is time to develop another type of question. This one should be concerned with the content of the overall project topic. Once the instructional goal of the project is decided, students will form or be given a question dealing with that goal. The question gives the students the reason for researching information in order to form possible solutions. Students become much more involved and there is higher motivation as they are dealing with real-world situations. These may be current problems such as a polluted river that runs through the town's park, or a problem from the past such as the travel conditions of the pioneers who settled the western United States.

In the **development of ideas** for any project it is important to determine if a similar program already exists. It would certainly not serve any purpose to be redundant except to improve upon an idea, to meet the needs of a different audience or to take a very different approach. As students are looking to form solutions to their problem, it is possible they could repurpose media they have discovered on the topic, in a new way. This might include tapes, recordings, laser discs, text, and/or graphics. There is a **juristic** issue in using media from some sources. Designers must carefully adhere to any copyright issues. Students should create a **reference** screen in their project to give credit to sources of information used. In addition, it is the responsibility of the author/designer to determine the legality of using text or graphics they have chosen, even if they are planning to credit the author or source.

As the students, or designers, begin to gather data to be incorporated into the project, the question becomes, how should this information be translated to hypermedia? Taking advantage of the intended audience's knowledge of their environment, a **metaphor** could be used to convey the concepts of the project. A metaphor uses concrete, familiar ideas so that the users have a set of expectations in place when they use the program. Mark Schlichting, creator and designer of

Broderbund's Living Books, states that the user should be involved with the learning and be having fun instead of being involved with how to run the computer (Apple Computer, Inc., 1994, p. 131). Using software should appear to be intuitive. In order to visualize the organization and development of the project, creating a storyboard can be a useful tool. This may lead directly to constructing a concept map or a **web** to see the relationship of the information.



It is part of the on-going process of **build-review-revise** and **evaluation.** By carefully planning before the on-computer construction, saves time as designers assess each others' screen sketches and ideas for interaction.

Non-interactive hypermedia projects do little more than present information. It is important to take full advantage of these new authoring **software** programs and make certain the designers create an interactive project. The users then become involved with using seeing, hearing, and doing this new knowledge (Anderson & Veljkov, 1990, p.ix). One of the major considerations of this interactive environment will be the **navigation**. This the ability to link one part of any given information to additional information. It is essential that the user not get lost or lose interest. The design of the navigation should be **consistent.** This is to be true for placement and meaning of these links. **Icons** are often used to denote an available path connection. The symbol or **graphic** used should always have the same meaning. Colors can also be used to orientate users. It is important that users always know where they are. Users should be able to reverse any action. This is an area that needs consistent assessment. If any of these features do not work, revision must take place.

Designers need to provide adequate **feedback** to users. This should be timely, short, and expressed appropriately for the users and the task. These can be audio or visual cues to tell the user the software is responding to their input.

The authoring software used in schools is **object**-oriented. Whatever is placed on the screen is an object. These objects have certain properties. Things can be done with or to an object. These are operations, such as moving or copying. Objects also exist in relationship to other objects. When the screens are developed, the user must be considered. What information is the most important to the user? On the introductory screen, it may be the text item (an object) and/or a related graphic item (an object). The **visual effect** of this object should be dominant to motivate and orient the user as to what the information in the program will be about. Additional objects will be placed to help the user navigate to further information. There should be a structure and balance to the screen's objects with the emphasis on the focal point. In Western society visual orientation goes from left to right and top to bottom.

Each screen developed should follow a similar relationship of the objects or elements needed. The screen layout includes size, spacing, and placement of objects to create a visually consistent and predictable environment. It communicates the purpose of the elements displayed.

Other design issues should be taken into consideration. Color is important but it also is personal and it may be negative or distracting. Microsoft in *Windows Interface Guidelines* suggest designing in black and white and then adding color (p. 369). Fonts should also be selected carefully. Avoid italics and limit the number of fonts and styles. Using a common font provides visual consistency. Capitalization of titles is proper but any other text should be displayed with only the first letter of sentences or phrases capitalized. **Graphics** are used to orient, inform, entertain, and enhance information. Be consistent in the placement. The relationship between the graphic and the text should be clear. Other graphics or icons must be consistent in meaning and in placement on each screen. As with color, certain graphics may have a cultural impact. Careful analysis of the users will be needed to prevent this from happening.

Designers should provide **help** for their users. There are a variety of options for the help provision. It might be in the form of an icon branching to a separate screen or to a pop-up text window that displays needed information. Users need to feel that they are in control throughout their interaction with the program. It is important for the designer to create the project with **user control** in mind.

IMPLICATIONS

As noted earlier, instructional designers through the years have influenced the guidelines still in use today in the development of multimedia products. Apple Computer and Microsoft both list in their recent guidelines for the human interface, the same principles of design that have been noted for some time. This is not to say that research should not continue or that there isn't room for improvement on many products.

The guidelines are there. They should be put to use. It is more common place today for teachers and students to use applications such as presentation software, World Wide Web HTML documents and hypermedia programs that allow communication in a combined text and graphics environment. Visual design is an important consideration in the development of these materials. For the professionals in our field it is our responsibility to provide guidance in this arena. Students are given instruction in the rules of clear communication in speech and the rules of clear communication in a traditional text document. Now it is time for them to receive similar guidance so they may learn to communicate more clearly using text and graphics.

List of Alphabetical Terms

A audience
B build review revise
C consistency
D development of ideas
E evaluation
F feedback
G graphics
H help
I icons
J juristic
K knowledge
L learning/instructional styles
M metaphor
N navigation
O objects
P planning
Q question
R references
S software
T terminology
U user control
V visual effects
W webs
X x marks the spot / Y you are here
Z zoom

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Formative Evaluation and World-Wide-Web Hypermedia

William J. Gibbs

He Ping Cheng

Introduction

Hypermedia programs are computer-based software systems for organizing and storing information. They are structured as an arrangement of nodes (concepts in text or graphical form) and links (semantic relationships between concepts), and allow users to obtain mediated experiences non-sequentially based on individual need and interest (Kumar, Helgeson & White, 1994). Users can create unique lesson structures reflective of individual learning requirements (Park & Hannafin, 1993). Early computer-based learning programs often forced users to page sequentially through information one screen at a time from beginning to end. Today's hypertext and hypermedia programs, on the other hand, typically provide clickable objects (e.g., text, pictures, etc.) as a means to access additional and/or related information. For educational purposes, these environments have the potential to represent knowledge (Bower & Hilgard, 1981). Accordingly, they may help to facilitate information encoding and retrieval (Park & Hannafin, 1993) and more appropriately serve human information processing needs.

Proponents assert that hypermedia programs are ideal for adaptive instruction. They contend that students can discern which information to study and thus can organize it to match their cognitive learning capabilities (Park, 1991). While hypermedia programs provide greater learner control, a well-cited problem with these environments is that users frequently "get lost" or disoriented (see Conklin, 1987; Neilson, 1989; Edwards and Hardman 1989). As the number of nodes and the complexity of their linkages in the hypermedia program increase, it is not unusual for the users of a complex hypermedia program to get lost in the middle of the program (Park, 1991). As Stanton and Baber (1994) point out, the phenomenon of getting "lost" can take several forms: users not being able to find required information or becoming disoriented, losing their way or being unable to formulate appropriate actions. This problem is fundamental to the design of hypermedia programs. It may be compounded in networked environments such as the World-Wide-Web (WWW) which have the capability to expand access world-wide presenting users with a seemingly infinite number of nodes and links.

While world-wide hypermedia systems are having tremendous impact on information access and retrieval, their development, it seems, is often influenced more by the technological capabilities of computers rather than by visual and interface design principles. Such environments are frequently designed as scrambled, content-free information or gibberish and more complex systems being developed appear to compound this problem (Stanton & Baber, 1994). Technologically, developers have the capability to include pictures, text, audio and video in documents and to almost instantaneously link to sites throughout the world. However, design protocols often differ from one site to the next which can confuse users and increase the possibility of them getting disoriented or "lost". For example, browsers of the World-Wide-Web are likely to find many dissimilar home page designs. While "web browsers" (e.g., Netscape, Mosaic) provide navigational options, home page developers often add navigational elements which confuse and mislead users and are not consistent from one site to the next. Developers should attempt to understand how users browse information and how the design of documents influences user navigation.

Purpose of the Paper

Complex interactive hypermedia pose significant challenges for those researching its effect on users (Gay & Mazur, 1993). For example, it is no simple task to design a world-wide access hypermedia system which all users find intuitive and easy to use. Understanding how users interact with these systems is important because their success is often contingent on an appropriate human-computer interface. However, while powerful from an information processing perspective, flexible, non-sequential, user-centered designs make it more complex to examine how users interact with a system (Gay & Mazur, 1993). Moreover, as the utilization of media objects such as video, audio, and animation increases, so does the difficulty of designing an effective user interface (Wadlow, 1990, p. 181).

To better understand the human-computer interface, recent formative evaluation approaches have taken a more holistic view (Winograd & Flores, 1986). Many approaches advocate qualitative methodologies (Card, Moran & Newell, 1983) using multiple data collection instruments (Marchionini, 1990) in an attempt to develop an understanding of how computer-based systems are used. The video-split screen (Gibbs & Shapiro, 1994) is one such technique for monitoring the interactions between user and computer. This method video records subjects' actions and decisions in a program, their verbal commentary and elaboration, their observations, and nonverbal and attitudinal reactions. Through a video effects generator, two images (subject and computer screen) are integrated so that the subject's behavior can be observed simultaneously with the computer screen. Subject and computer screen are each simultaneously video-recorded. This technique provides a permanent visual and auditory account of evaluation for subsequent analysis. Among other things, this data helps to identify users' reactions, needs, use patterns, and interactions and portrays, to some extent, a more fuller representation of them in the learning environment. From it, researchers can potentially design more powerful environments.

In recent years, there has been much interest in methods that help researchers understand cognition and the interplay between learners and computer-based learning environments. With techniques such as the video-split screen, a learner's interactions with a computer can be collected using multiple data collection instruments and analyzed to obtain a fuller awareness of their thought processes.

This paper discusses a formative evaluation method by which to assess World-Wide-Web documents. Also presented are results from a pilot evaluation which examined users' interactions with Web documents and the effects of providing "document maps" to guide users to specific information.

Methods

A video-split screen technique was used to record users interacting with the World-Wide-Web and to assess the design of associated documents. Three female and two male subjects participated in the evaluation sessions. Four of the participants were undergraduate students and one was a graduate student. Most of them had used the World-Wide-Web no more than three to four times prior to the evaluation sessions.

Observation Technique

Subjects were given two tasks: 1) to browse the World-Wide-Web and locate specific information/documents and 2) use and assess Eastern Illinois University's Department of Media Services Web site. On each task, subjects were asked to think aloud. They took as much or as little time as they needed. Periodically, the researchers prompted them to speak up or tell what they were thinking.

Task 1

On this task, subjects had three trials. For each trial they had to find one document located within a web site. Printouts of the documents to be found were given to the subject. The site chosen for this task was the White House; however, many other sites could have been substituted for it.

On trials 1 and 3, "document maps" were provided to assist with information searches. These maps consisted of a hierarchical breakdown (in text form only) of topics that directed subjects to the document for which they were searching. The map was positioned in a window behind the Web page and would display when clicked with the computer's mouse. No map was available for the second trial.

Task 2

For this task, subjects used Eastern Illinois University's Department of Media Services' home page and talked aloud while interacting with it. Subjects were asked to critique the home page, suggest revisions, discuss misunderstandings or provide any commentary that would contribute to improving the document. They could spend as much time or as little time as they wanted on this task.

At the completion of the session, subjects filled out a survey which collected information on their reactions toward the usefulness of the "document maps". The survey also collected data related to subjects' computer experience and knowledge of the World-Wide-Web.

Results

This was a pilot study with a small number of subjects. Given this constraint, no attempt is made to generalize the findings discussed below to other groups. Nevertheless, the study yielded informative data worthy of additional research.

It appears that the video-split screen method can be an effective means to assess WWW documents. The video recordings allowed the researchers to visually and aurally reconstruct the actions taken by subjects. This is beneficial for several reasons. First, it enables one to simultaneously monitor, among other things, how users navigate in a system, the types of options selected and the order in which they are selected. It also shows where users appear confused or where they get lost, what they like and dislike, and their observations about the program. Second, the technique allows for learners' immediate feedback about their interactions with the program. Other forms of assessment may not fully reflect a subject's instantaneous processing of stimuli or the way in which one explores and links conceptual events presented by the hypermedia system. Third, assessing a system can be a laborious task when users are asked to record/write their comments and reactions. This method of assessment removes the burden of evaluation from subjects and allows them to more easily provide feedback. Lastly, the technique permits the review and validation of observations by several reviewers. Sample transcripts, resulting from the evaluation sessions, are presented in Figure 1. Transcripts made from the video recordings provide a useful resource for analyzing subject-computer interaction.

Figure 1
Structured Observation Transcript Sample

"All this extra space and all these little pictures. They don't really draw your eye ..."

"I was just kind of wondering where I am. Uh, it looks like I started something major just by all the data going back and forth."

"I like the purple and blue, the colors are really bright, they catch your eye, it looks neat. It seems like it gets kind of repetitive, everywhere you go you end up just seeing the staff's names, the name of the staff personnel."

"I don't know what else is supposed to be on here, the interactive learning, I thought that would be a little game or something to play -- to learn how to use the computer, but it wasn't."

On three occasions, subjects were asked to find one document located within the White House WWW site. They were given printouts of the three documents and asked to locate them on the web. On the first and third trials a "document map" was provided. No map was available for the second trial.

There appeared to be differences in the way subjects reacted during search trials depending on the availability of the "documents map". In the second trial, for example, there was no map and most of the subjects showed what appeared to be impatience soon after their first few attempts to find the document failed. Three of the subjects showed uneasiness after two minutes. They looked for the information aimlessly, proceeding forward and backward through many screens and quitting the task before finding the document. Figure 2 indicates that most subjects took less time to find documents on the first and third trials (maps available) than on the second (no map available). Three subjects had 4 or more years of computer experience. Despite this computer familiarity, the search tasks, especially trial 2, posed difficulty for them. It should be pointed out, however, that experience with computers does not necessarily mean that one will be able to effectively search the Web having little prior exposure to it.

Figure 2
Time Spent Searching (By Trials)

Trials	Minutes in Search					Total Time
	S1	S2	S3	S4	S5	
1st	07	08	09	05	12	41
2nd	14	07	25	10	15	71
3rd	08	06	03	13	02	32

Subjects stated that the "document map" was very useful when searching for documents. From observations, it appeared that subjects attempted to first find the documents without the aid of the map. However, once it was clear that the map provided a visual guide to the to-be-found documents, their use increased. Three subjects use of the "document maps" increased from the first to the third trial. Use was determined by counting the number of times subjects viewed the map on each trial. On trial 1, subjects 3, 4 and 5 used the maps a total of three times. Their use of the map increased to a total of 16 times on the third trial (see Figure 3). Subjects 1 and 2 used the map less on the third trial than on the first.

Figure 3
Number of Times Maps Were Used (By Trial)

Trial	Number of Times Map was Used					Total
	S1	S2	S3	S4	S5	
1st	05	12	00	02	01	20
3rd	03	11	07	03	06	30

During trials, subjects initially seemed to search for context and informational clues rather than visual clues and some resorted to aimlessly clicking navigation options only after all other approaches failed. This has implications for designers in that the informational content presented should be supported and/or coincide with visual cues and navigational elements. For example, while certain visual cues attracted attention, subjects also read the text on-screen and from this made inferences as to where they might find the documents for which they were searching. Thus, it was not a haphazard random process by which subjects searched for information -- the meaning of the presented information was seriously considered and directed their search efforts.

Discussion

As the World-Wide-Web is used for the delivery of instruction, it is important to provide learners with a means of instructional support. This is particularly important, given that users frequently experience disorientation within hypermedia systems. For instructional purposes, learners need information about how to find topics and concepts under study. Creating "document maps" for use with the World-Wide-Web can be a time consuming process considering the seemingly infinite number of nodes and links that could be established. However, from this pilot study its seems even the simplest of maps are useful. When a finite path is established to reach a particular topic, a simple hierarchical breakdown of the topics will be of much value to learners. It provides them with a guide and appears to prevent them from getting side-tracked by distracting information.

From this study, it was observed that subjects need to be shown that a "document map" exists for their use. They also must be explicitly informed as to its purpose and function. In some cases, it was not until several failed attempts and much frustration that subjects realized that they had the map. Therefore, for instructional purposes, such resources should be made identifiable and easily accessible to learners. It would have helped if subjects had a "Read Me First" button which informed them about the purpose of the map.

In this study, a map was provided by a separate application and was not clickable. Nevertheless, subjects made repeated attempts to click the words on the map in attempts to go to a destination. When no action resulted from their clicks, some appeared confused and experienced difficulty getting back to the search. Therefore, whenever possible, designers should provide navigational elements or clickable objects on maps so that when users click them, they are taken to the desired location.

Summary

This paper has discussed an approach for assessing World-Wide-Web hypermedia systems. Recent assessment approaches have become multifaceted and holistic in an attempt to more fully understand the human-computer interface. Data collection instruments, such as the one discussed in this paper, have the potential to provide more direct comprehensive evaluations of complex systems.

A current problem with hypermedia programs is that users frequently "get lost" when using them. Developers must consider methods to guide users to information and to reduce the potential of them becoming disoriented. From the analysis presented, informational maps will likely increase the efficiency with which learners search for information. When designed effectively, they appear to have positive impact on students. Moreover, these maps can present the structure of to-be-learned information and thus have positive learning benefits.

Further Research

From this pilot, a more in-depth study is planned to examine the effects of maps on users' browsing behavior and cognitive processing. Using the techniques described in this paper, it may be possible to determine the effects of various types of maps and WWW interface designs on users' cognitive processing. Our knowledge of learners' thought processes in various types of computer-based learning environments is limited (Nakhleh & Krajcik, 1991). Using techniques like the video-split screen with methods to analyze subjects' verbal commentary such as protocol analysis (Ericsson & Simon, 1984) may prove useful in better understanding learners' cognitive processes while engaged in a hypermedia program. From this knowledge, more effective design may result.

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Computer-Based Testing And Strategies for Distance Learning

William J. Gibbs

Introduction

The assimilation of computer technology in society has enabled computers to be used for a variety of educational purposes with some standard uses being in the area of learner assessment (Eaves & Smith, 1986). While paper-and-pencil tests have been a standard means of educational measurement (Olsen, Maynes, Slawson, & Ho, 1989), assessment methods are changing and will continue to change with the development of more advanced computer-based learning environments.

In terms of educational measurement, computers serve many functions and offer some distinct advantages over traditional methods. From an administrative perspective, computers provide an accurate experimental tool with which to conduct and manage learner assessment. They can control many of the routine tasks or clerical duties associated with such processes. Computers increase efficiency in test duplication, administration, scoring, item banking, record keeping and analysis (Eaves and Smith, 1986) and offer more organized assessment (Johnson and Harlow, 1989).

From an instructional perspective, computers enable standardized testing conditions, individually administered tests, immediate test scoring, increased variety of testing formats, and ability to collect test and item latency information (Olsen, Maynes, Slawson, and Ho, 1989). They are capable of presenting test items and evaluating them. For example, many computer testing systems generate unique question sets for each learner. Based on previous responses to questions, the computer determines which questions are appropriate for each individual (Cudeck, Cliff and Kehoe, 1977). Computer-based tests give educators the capability of providing learners immediate feedback or knowledge of results. With paper-and-pencil tests, there is often a considerable time lapse between the time of testing and the time at which test results are reported. Finally, computers have the advantage of being completely objective, which is not possible with humans (Johnson and Harlow, 1989).

Computer-Based Testing

The research literature appears to support the claim that computer and paper-and-pencil test administration produce comparable results in learner achievement scores. Stile and Pettibone (1983), for example, found no significant differences in acquired scores when comparing computer testing to paper-and-pencil. Eaves and Smith (1986) report that undergraduate college students' achievement scores on computer administered tests are similar to that of paper-and-pencil.

Assessment is a fundamental part of education. Traditionally, multiple-choice and true/false tests have been the predominant means of assessment. While used heavily, and appropriate in many cases, current educational perspectives (e.g., constructivists approaches) require that assessment also focus on higher order thinking and problem-solving abilities.

A potential advantage of computerized testing is the capability to allow users to interact with tests. Research suggests that allowing for interaction during testing promotes learning. For example, giving learners the opportunity to respond to feedback has been shown to facilitate higher levels of achievement (Marrone, 1991). Activities during computerized testing which help learners relate new information to existing knowledge (e.g., responding to feedback) may prove beneficial to learning and should be considered by instructional designers. It is possible that as computerized testing procedures become more interactive and dynamic, higher order learning may be facilitated.

Purpose of Paper

This paper reviews the TestMaker project in which computer-based programs are being developed to help educators create tests. Interactive testing, record keeping and advisement on test creation are discussed. Also presented is a discussion of a computer-based module developed for this project, which is being used for distance learning instruction. The module provides for presentation and analysis of question items and feedback during class lectures.

TestMaker Objectives

The development of TestMaker was initiated by requests from faculty at Eastern Illinois University for a computer-based test development and learning tool that would 1) provide instruction on effective strategies for creating tests and 2) assist in the creation of computerized tests that evaluate and record student performance. The program was designed as an instructional and developmental tool for teacher-education students. Recently, the program was expanded to include a Presentation Analysis module which enables educators during their class lectures to present questions to the class, ask for feedback and graph class responses. The objectives of this project were to:

1. create a test development module that provides students instruction and help with creating tests,

2. create a computerized test development tool that facilitates easy test creation to meet an expressed need of faculty,

3. develop a computer-based module that incorporates testing strategies aimed at facilitating higher order learning,

4. develop a computer-based module to be used for distance learning instruction that enables instructors to review and analyze question items and feedback during class lectures.

Overview of Prototype Design

TestMaker is a prototype that consists of four modules: 1) Advisement, 2) Test Creation, 3) Student Test, and 4) Presentation Analysis. Currently, the Test Creation module enables users to create multiple-choice tests. From a question template screen, test items and feedback are entered and subsequently a student test file is created. The Advisement module runs concurrently with the Test Creation module. It provides advice and information on such topics related to effective test construction. At any point during test creation, users have the option to execute the Advisement module. Once all test items are entered, a test is created. This allows students sitting at a computer to take the test, interact with it and receive feedback on their performance. The Presentation Analysis module assists in the analysis of test items for class lectures and test reviews. Each module is discussed in more detail below.

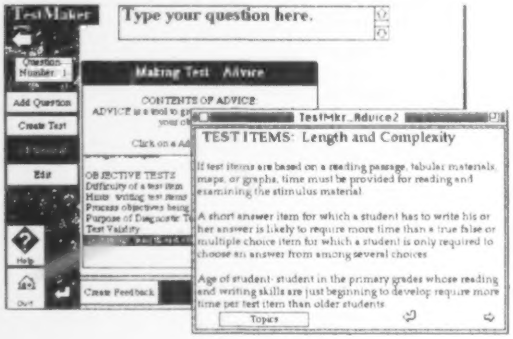
Modules of TestMaker

Advisement Module

The Advisement module provides users with two types of advisement: system-generated advice and user-selected advice. As tests are being created, the system will prompt users when it appears that an item violates test construction guidelines. This is referred to as system-generated advice. For example, if a user attempts to enter twelve alternatives for a multiple choice question, the system will advise the user that this may be inappropriate.

User-selected advice operates concurrently with the test creation program. When selected, this option presents a scrolling list of topics. With the computer's mouse, users click on key words in the list and are presented a window of information on the topic. The Advisement module provides information on such topics as types of feedback, designing feedback for intellectual skills instruction, test item length and complexity, hints for writing test items, and test validity (see Figure 1).

Figure 1
TestMaker: Advisement Module



TEST ITEMS: Length and Complexity

If test items are based on a reading passage, tabular materials, maps, or graphs, time must be provided for reading and examining the stimulus material.

A short answer item for which a student has to write his or her answer is likely to require more time than a true false or multiple choice item for which a student is only required to choose an answer from among several choices.

Age of student- student in the primary grades whose reading and writing skills are just beginning to develop require more time per test item than older students.

Test Creation Module

To create a multiple choice test, users enter each question and a set of alternatives by typing in pre-defined text blocks. Once questions and alternatives have been entered, the system prompts the user to choose a correct answer. This is done by clicking on the correct answer for a particular question. Previously entered questions and alternatives can be viewed and edited in the system's edit mode. This mode allows for each question to be modified. Additionally, all test items can be viewed together and altered as needed.

For each question created with the module, users can incorporate feedback which will be displayed for students during testing. Numerous studies indicate that learning is effected by practice and feedback. Giving learners feedback as to their progress in a particular subject is an essential ingredient of effective instruction. Consistent feedback helps to motivate learners in learning pursuits; it gives them knowledge of their performance and it enables the instructor to assess progress made by individuals (Corcoran, 1985). Types of feedback range from merely presenting results to presenting in-depth explanations about responses (Lee-Sammons & Wollen, 1989).

As a form of feedback, the correct answer can be presented for incorrect responses. Thus, if the instructor enters feedback and selects the correct answer display option, the student, upon responding incorrectly to a test item, would be presented the correct answer along with the instructor's feedback. Providing students knowledge of correct responses may be a useful strategy. The process of comparing and judging responses may serve a as means to increase interaction and to subsequently invoke deeper cognitive processing. It may encourage learners to think about their own work which can add substantially to assessments (Tittle, 1991).

The type of information processing in which learners engage during instruction impacts the degree of learning that takes place. Therefore, a critical factor in designing learner responses is the level of processing they invoke in learners (Jonassen & Hannum, 1987). The test creation module has an option for interaction during testing. While still under development, the purpose of this feature is

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to allow test takers to respond to feedback, explain their answers and/or to justify why they are right or wrong. For example, if the instructor had selected this option, students, upon responding to a particular test item, would be prompted to elaborate as to why their response was correct. The student would then type an explanation which could later be reviewed by the instructor. This type of elaboration is hypothesized to facilitate information recall by providing additional information for the formulation of responses (Gagné, 1985). Activities such as elaboration may help learners organize information and thus assist them with integrating new information with their existing knowledge (Park & Hannafin, 1993). In this respect, the testing experience itself becomes a type of learning strategy which helps to facilitate learning.

Student Test Module

The test file is generated from the test creation module. Once generated, it can be given to students on disk or over a local area network. All question items, correct answers, alternatives and feedback created in the Test Creation module are presented. During testing, student responses, elaboration and instructional time are recorded to a file which can later be reviewed by the instructor. Upon completion, students are given a grade.

Presentation Analysis Module

The Presentation Analysis module was designed as a presentation tool for distance learning. It resulted from an instructor's need to present, analyze and discuss multiple choice questions during class lectures. In reviewing a particular class topic, the instructor would present a question to students and have them discuss it to determine the correct answer. This was originally done with paper-and-pencil. However, when designing class materials for distance learning, the instructor saw a need to provide a more thorough analysis of questions and thus the Presentation Analysis module was developed.

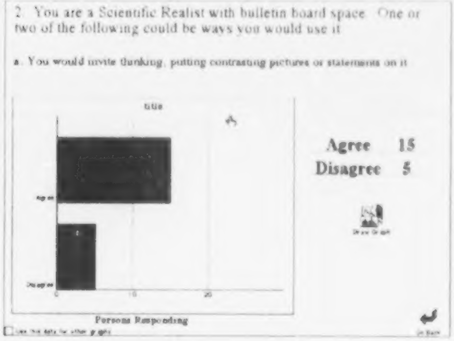
Since the program is used for distance learning, much consideration had to be given to visual design. In a distance learning environment, a scan converter is used to convert the computer's output to an analog signal that the distance learning system could recognize. Typically, in this conversion process, some degradation in image quality results. Moreover, distance learning systems require that attention be given to the design of visual materials. Therefore, font sizes should be sufficiently large enough in order for the visual to be read easily. A font of 24 points is often suggested as an adequate size. However, multiple choice questions when entered into the module at a 24 point font size tend to clutter the screen. Depending on the amount of text in the question being displayed, words were often outside viewers' visual field. To circumvent this problem, text size was made adjustable. Therefore, any word on screen, if clicked, would enlarge to a bold 24 point font size and subsequently reduce to a non-bold 18 point font size when clicked for a second time. This served two purposes. First, it helped to ensure that text could be viewed. Second, adjusting font sizes served as a cueing device to direct viewers' attention to the specific points being discussed.

This module assists in the analysis of questions by allowing the instructor to log the number of students agreeing and disagreeing with each alternative. For example, the instructor can highlight a particular question alternative and ask students if they agree or disagree as to whether it is correct. The number of students agreeing or disagreeing can be entered and dynamically graphed for students to view at the remote sites.

The module keeps a running tally sheet of the number of students agreeing and disagreeing with each question alternative. This is useful for determining the concepts students understand and those which they do not understand. The number of questions and the sequence in which they are presented is tracked by the system. For instance, an instructor may choose to review questions out of order.

At any point during a lecture, the instructor can view the tally sheet and determine those questions which were viewed and those that were not. Figure 2 depicts the analysis mode of the module.

Figure 2
Presentation Analysis Module



2. You are a Scientific Realist with bulletin board space. One or two of the following could be ways you would use it

a. You would invite thinking, putting contrasting pictures or statements on it

Agree 15
Disagree 5

Each question alternative can have feedback associated with it explaining why it is correct or incorrect. By selecting the Feedback Option and then clicking any alternative, feedback for that item is displayed. All questions and feedback can be easily updated and new items can be imported from a word processor.

The Presentation Analysis and Test Creation modules are integrated. Once test items are entered during test creation, they are transferred and formatted into the Presentation Analysis module.

Further Developments

As the World-Wide-Web (WWW) expands, so does the potential to provide distance learning opportunities. While rapid, seemingly unprecedented developments occur with World-Wide-Web browsers such as Netscape, the interactivity required for computer-based testing is not yet available. However, it is inevitable that further developments will expand the degree to which users can interact with WWW documents. It is the author's plan to integrate the TestMaker modules with the WWW. For distance learning purposes, a web page can be set up so that instructors and students at any location will be able to access a form in which to enter test items. This information can then be sent to a server containing the Presentation Analysis module which will import and format these items for analysis and presentation to remote sites. For example, a teacher-education instructor teaching concepts of test construction to two remote sites could ask each site to work in groups to generate objective test items for a particular topic. Test items could be entered into the WWW form and sent to the Presentation Analysis module for importing and formatting. They could subsequently be presented to both sites for students to critique and analyze.

Future developments with the TestMaker project will investigate the possibility of testing students at remote distance learning sites. While there are many issues which must be taken into account with remote testing (e.g., test security, cheating), it may provide worthwhile benefits. Test items could be posted on the World-Wide-Web. The Presentation Analysis module could receive students responses (e.g., entered via the WWW) to questions. The instructor could import the data into the module and subsequently analyze it. At a minimum, this could reduce instructor time spent on grading, as well as provide for easy updating of test items. Also, compared to paper-and-pencil tests, this approach, given the analysis capabilities of the Presentation Analysis module, would provide for more thorough test reviews and analysis during class lectures.

Summary

In recent years, it has become apparent that computers serve many functions and offer distinct advantages over some traditional educational assessment methods. In many instructional settings, computers manage the routine tasks related to assessment. They are capable of presenting test items and evaluating them. Computer-based tests, among other things, give educators the capability of providing immediate feedback or knowledge of results to learners and interaction during testing. This paper discussed a project aimed at providing educators with a means by which to develop computer-based tests. The project investigates instructional strategies such as interaction during testing that may help students generate their own meaning from information and subsequently construct knowledge. Means to present and analyze test items for distance learning classes were also discussed. Currently, delivering objective tests over a distance is often difficult. While the approaches for distance learning testing presented in this paper do not resolve many of these issues, they do provide educators with some strategies for testing and learning. As developments in the World-Wide-Web continue, it may eventually be possible to provide effective testing methods and associated instructional strategies at a distance.

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The Elements And Principles Of Visual Organization

by Robert E. Hagerty

WHAT WE KNOW:

- The role of visuals as a medium of communication becomes increasingly important as use of the computer becomes more universal.

- The majority of people who are using computers have had little or no training in visual studies. They are often unaware of the existence of an organized visual language.

- Miscommunication is often the result of attempts to make oneself understood in what is effectively a foreign language. Even a document that is all text must be visually well organized if it is to communicate effectively.

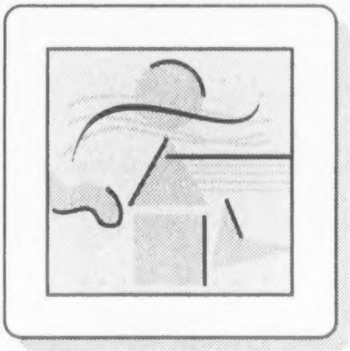
As a member of the University of Cincinnati's Visual Literacy Committee I developed a slide-lecture, "The Elements of Visual Organization", which I presented at four weekend workshops we held for faculty from all areas of the campus. I consider the slide-lecture to be a type of "primer" on visual literacy. Since most of the faculty participants were from disciplines that do not involve any form of visual studies, they had not been exposed to the terms and concepts which are common to people engaged in visual communications.

Working from a list of the elements and principles of visual organization which was compiled by Dr. Hermine Feinstein, chair of the University's Visual Literacy Committee, I designed a set of twenty-nine slides to illustrate these elements and principles.

The illustrations are computer generated 2" x 2" slides, all of which are based on a single, non-objective composition. Some are black and white, others are color, depending on the content of the illustration. The presentation was designed to be accompanied by oral commentary, preferably in the form of a dialogue with the audience rather than a standard lecture.

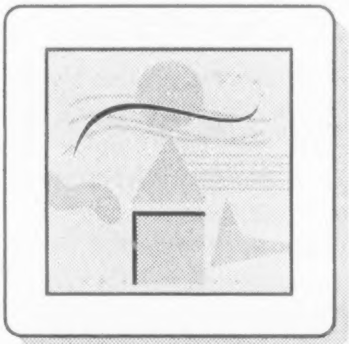
The slides make no direct reference to work on the computer but are applicable to any visual format. It happens, however, that most people now have their first encounter with manipulating visual elements when working on a computer generated document. When I recently presented this slide-lecture to a colleague's class in electronic media, the students seemed to have no trouble seeing how the concepts might apply to their projects. Indeed, they were pleased to learn of the existence of a systematic visual grammar.

I will reproduce here several of the images I created for the presentation along with an brief approximation of the spoken commentary which accompanied them. Having presented this several times, I have learned that there are some important points to discuss aside from the basic information. While many of the associations prompted by the elements and principles are derived from our physical bodies and surroundings and can therefore be considered universal, some are culture-based and cannot. (Reactions to color tend to be especially dependent upon cultural factors. In the west we designate black as the color of mourning. Other cultures use white, gold, or purple to signify the same.) Making this clear can save a lot of confusion and help keep the discussion focused. It is also worthwhile to let the audience know that these elements and principles have been around and agreed upon for a very long time; that this is simply a presentation of a widely accepted visual language.



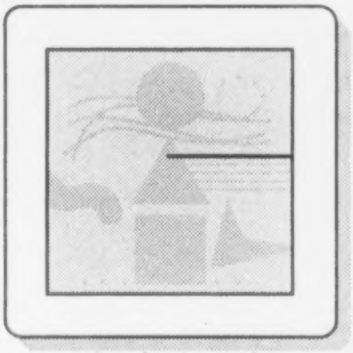
Line

Line is the path of a moving point in space. Line creates edges and boundaries. It depicts movement.



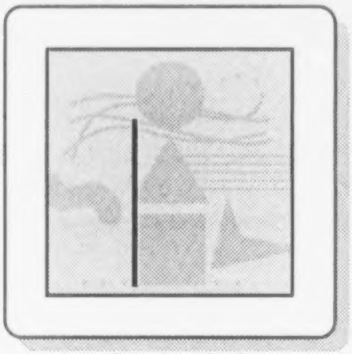
Line: curvilinear and rectilinear

Curvilinear line suggests delicacy and spontenaity while a rectilinear line suggests certainty and directness. What do curvilinear letterforms, such as script typefaces or handwriting, say to you as opposed to what block lettering might indicate?



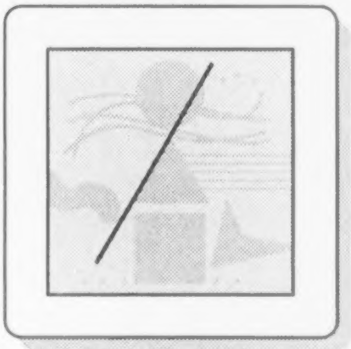
Line: horizontal

Horizontal line suggests rest, quiet, and calm. The human body rests and sleeps in a horizontal position. During a relaxing day at the beach one's field of vision is primarily exposed to the calming aspect of the sea meeting the sky at a horizontal juncture.



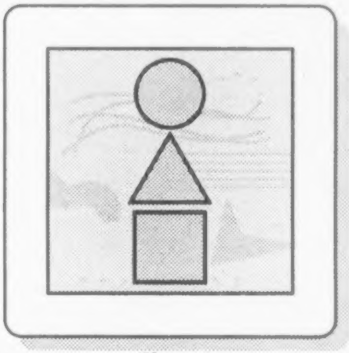
Line: vertical

Vertical line suggests the state of alertness and attention. A soldier standing at attention is in a vertical position. Buildings in a cityscape are vertical, reflecting the necessity of an inhabitant to be alert and aware.



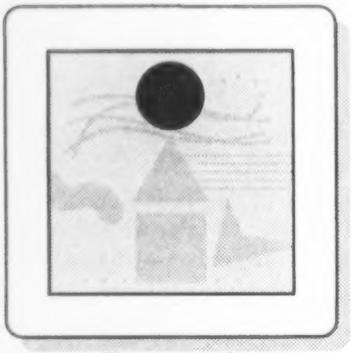
Line: diagonal

Diagonal line suggests movement. If the soldier who was standing at attention begins to run his body takes on a diagonal orientation. A tree falling is a diagonal line. A diagonal roof plane leans against other planes to achieve stability.



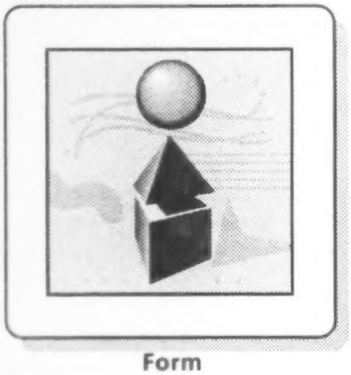
Shape

A line connected to itself produces a shape. A shape is any 2-dimensional form which is bounded by a line, a value, or both. Although infinite in their potential complexity, shapes fall into three basic types: the circle, the triangle, and the square.



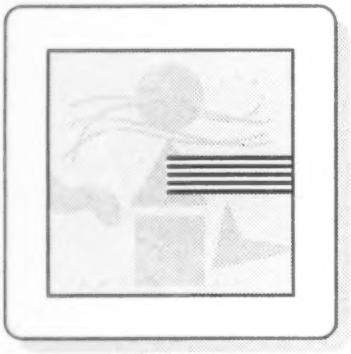
Shape: circle

The circle expresses endlessness, warmth and protection: an endlessly revolving wheel, the warmth of the sun, the protection of a wagon train, an encircling embrace.



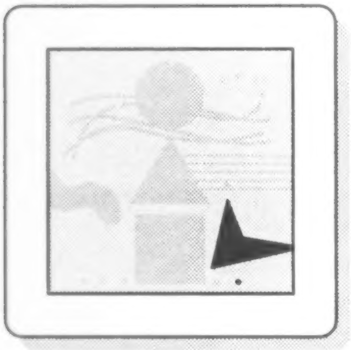
Form

Up to this point we've dealt with simple shapes. While everyday life demands that we confront very complex, three-dimensional form, the human mind will intuitively seek simplicity and the reduction of the more complex forms to elemental shapes will help reveal their meaning.



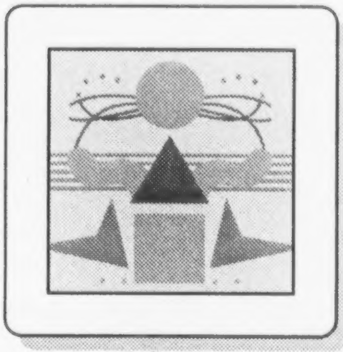
Pattern

Pattern is a two-dimensional, predictable repetition of basic elements. As our lives, which are made of a pattern of repeating days, a graphic pattern may be seen as dull and monotonous or endlessly fascinating in its richness and subtle variation.



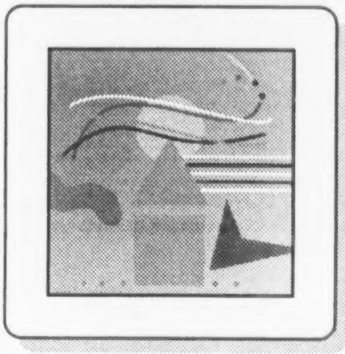
Scale

Scale establishes a relationship of importance in a two-dimensional setting. Here the triangulate shape is clearly dominant to the point. In a three-dimensional setting scale might indicate distance as well as importance. Could it be that the point is larger than the triangulate shape but much farther back in space?



Balance

Balance may be symmetrical, asymmetrical, or radial. The symmetrical composition shown here evokes associations of formality – it moves less and is more "proper" than the others. Equilibrium is easier to achieve with symmetry but the result will never be as exciting.



Movement

In all but the most rigid compositions movement plays a vital role. Here the background moves from dark to light while the shape on the left would be described as undulating. The curved lines flow past the circle which has moved behind the triangle. The horizontal lines move to an alternating light/dark rhythm as the triangulate shape swoops beneath them. The square and triangle hold still in the midst of all this activity.

Although the set here is incomplete I hope these samples have given the flavor of my presentation. In this paper I have, for obvious reasons, excluded the many slides which are dependent on color.

I like to end the slide-lecture by pointing out that although the examples used have been constructed of non-objective shapes, the underlying concepts apply to any pictorial imagery, whether two-dimensional or three. Being aware of the powers in point and line, and shape and value and color; in other words being aware that there is a visual language, enables a viewer to read and understand visual imagery in all its infinite variety.

Eyes On Cognitive Styles And The Processing Of Visual Information

by Robert Sitz

Introduction

The specific manner in which an individual functions during the perceptual process of gathering and handling visual information from the environment has a long tradition of inquiry pertinent to several academic disciplines. One area of visual information processing, cognitive response to pictures, reveals an emerging body of scientific literature nourished by scholars in Psychology, Educational Technology, Art Education, Consumer Behavior, Graphic Design, and Mass Communications. There are probably others! "Eyes on the future" should see a greater convergence of ideas, issues and research brought to bear on fundamental topics such as "what do people learn from pictures?" as professionals continue to talk to each other at these conferences.

One visual communication format worthy of discussion, yet taken for granted, are the textbooks used by students at all levels of formal education. Today, textbooks embrace a wide variety of design styles and techniques. Graphics, pictures, and illustrations proliferate the prose content of textbooks in most subject areas. Yet there appears to be little consensus regarding the mediating effects of all of these visuals on student learning and understanding.

Literature Review

A review by Levie and Lentz in 1982 summarized a number of studies that demonstrated the positive effects that illustrations have on reading text. But they also described a number of cases where there were opposing effects, or no effects at all (Hurt, 1987). It has been hypothesized by a number of scholars that picture effects depend on such learner characteristics as age, sex, and intellectual ability (Levin and Lesgold, 1978). Even with the most well-designed visual communication, it apparently cannot be presumed that the readers' attention will be given to the illustration or the photograph (Hayes and Readance, 1983; Rosco, Tennyson and Boutwell, 1975), and if it can be determined that the reader has attended to the visual, it does not necessarily follow that interaction between the reader and the picture has been sufficient to cue the learner's attention to the most critical information (e.g., Allen, 1978; Dwyer, 1978; Gagne and Rohwer, 1969)

In an extensive series of experiments over the years, Dwyer has varied levels of detail realism in instructional illustrations of the heart to determine if the stimuli characteristics had differential effects on the achievement level of students. Despite these task appropriate illustrations, it does not appear that students experience comparable degrees of picture *facilitation. If pictures are* going to be effective, they must activate certain information processing skills within the learner. If the learner does not process those skills, poor results will be achieved (Levin; cited in Pressley and Levin, 1983). Evidence suggests that learners will frequently overlook detail in complex illustrations unless they are prompted to pay attention (Beck, 1984), and some individuals may benefit from systematically detailed visuals designed to further isolate important content (Goldsmith, 1984).

Once the picture is integrated with words, passages, or continuous text, the effects of pictures on the individual become confounded. For example, an experiment using one sentence propositions with simple line drawings may yield results different from those studies using line drawings with complex prose. Rusted (1984) has suggested that factual expository prose passages have produced a different pattern of results than have narrative passages. In sum, most scholars agree that pictures are "complex, multivariate media" (Hurt, 1987) and they perform different functions in different circumstances (Duchastel, 1978). Complicating the effect of pictures is the learner!

The Problem

Among the many objectives of education is the cultivation of those perceptual and cognitive skills that enhance the students' ability to critically examine visual information. A related individual difference in perception and learning/memory that has a solid grounding in research is the bi-polar trait of Field Independence-Field Dependence that is an outgrowth of Cognitive Style Theory.

The term "cognitive style" was originally coined by Allport in 1937 but greatly refined by Asch and Witkin. Witkin and his associates eventually broadened the idea to include "analytical-global" functions and "psychological differentiation." Today "cognitive styles" are seen as individual "*information processing* habits representing the learner's typical mode of perceiving, thinking, problem solving and remembering." (Messick, 1976). Field Independence versus Field Dependence has possibly been the subject of more research than any other Cognitive Style dimension (Keefe, 1987).

It has been hypothesized that Field-Independent people (FI's) are better able to separate information from an overall visual context, whereas Field-Dependents (FD's) respond more holistically to the stimuli context as given, without using mediational processes such as analysis and structuring. Compared to FI's, FD's are more dependent on external sources of structure and organization.

It is also suggested that when recalling information, the thought strategies of the two cognitive style types will vary greatly. The Field-Dependent person will remember the most noticeable cues and information recall will be hindered if the relevant visual cues are not obvious. Field-Independents are able to identify the most important visual cues whether or not they are made salient (Wilkin, et al., 1977; cited by Moore, 1985).

The implication is that increased stimulus structure at the time of information acquisition could help the Field-Dependent learner, whereas the Field-Independent learner would not be as dependent on manipulations that cue information organization.

There are a variety of design techniques that can help the student assess the priority (or importance) of diverse information elements within both text and pictures. For example, the text may cue the reader to attend to a particular picture. However, as suggested previously, just because the student notes the picture, it doesn't necessarily mean that the student will process the appropriate information contained within the picture. Research has demonstrated that picture cueing devices produce inconsistent findings in regard to the learner's ability to store and remember pictorial information (Beck, 1984; 1987).

Purpose of the Study

Given the Field Dependent student's more global approach to processing information, and apparent reluctance to use mediational processes such as analysis and structuring, it was hypothesized that certain pictorial information cues would most likely be ignored and that learning would be improved if detail was made more salient. For example, in an Art History textbook, a great deal of descriptive information is condensed into a compendium of historical background. The expository prose includes references to pictures that invite serious analysis and organization of visual detail. An Art History textbook presents an intriguing scenario for studying FI/FD predispositions to analyze, encode, and remember pictorial information!

The purpose of the study became one of designing a simulated art history textbook reading assignment utilizing a quasi-experimental design to:

1. determine if different picture design treatments have an effect on memory in a comprehensive picture-prose learning context;
2. investigate the effects of detail pictures (close-up pictures) as a design strategy for cueing the reader to encode and process visual information as reflected by their performance on a recall task;
3. compare the Cognitive Style dimensions of Field-Independence and Field-Dependence in regard to analysis and organization of complex picture and prose information that is either cued or not cued by detail pictures.

Research Questions

The answers to the following research questions were sought to clarify the mediational effects of picture design cues on the encoding of visual information detail given individual differences in cognitive style:

Null Hypothesis:

H_1 There is no significant difference in recall between Field-Dependent and Field-Independent cognitive styles.

H_2 There is no significant difference in recall between subjects participating in picture treatment "A" and picture treatment "B."

H_3 There is no significant interaction between Field-Dependent/Field-Independent subjects and picture treatment "A" or picture treatment "B" on a measure of free recall.

Study Design

In the interest of brevity, many of the research design specifics will be eliminated or summarized for purposes of this presentation so that more attention can be focused upon the gist of the study.

A sample size of 234 students was taken from a population of Freshman/Sophomore English students in a large metropolitan community college district.

In phase one of the study, students took the "Group Embedded Figures Test (GEFT)." The GEFT has been modeled after the individually administered Embedded Figure Test (EFT) that suggests a reliability of .82 for both males and females. The GEFT is a booklet that contains geometric figures embedded in a background. Some people have difficulty identifying the figures which must be traced with a pencil. For other people, the task of locating, or "seeing" the simple geometric form that is embedded within the more complex background is easy. Subjects were classified as Field-Independent, Neutral, or Field-Dependent based on their scores on the Group Embedded Figures Test.

Figure 1:
GROUP EMBEDDED FIGURES TEST.

Simple Forms Correctly Outlined	Cognitive Style
0 - 8	Field-Dependent
9 - 13	Neutral
14 - 18	Field-Dependent

During phase two of the study, students were randomly assigned to one of two different treatment groups. The treatments were two 1500-word expository prose passage(s) excerpted from A History of Art (Hartt, 1986). The passages were laid out on 8-1/2 x 11 typing paper and stapled together to create a booklet simulating a textbook reading assignment covering the topics of Greek Vase Painting during the Geometric, Orientalizing, and Archaic style periods of Greek History. The passages selected were descriptive in nature and referenced photographs of the vases pictured in the text. The prose and picture layout resembled the actual textbook pages in appearance.

The difference between the two treatments was in the number of pictures. Although the picture subject matter (a single vase) was identical, one treatment included additional close-up (detail) photographs and illustrations. The "detail" pictures highlighted various decorative and functional features of the Greek vases. The close-study pictures were outline drawings to emphasize the vase shapes and details such as handles; in other instances, the close-study pictures were small illustrations and photographs of ornament and decoration.

Figure 2:
SYNOPTIC PICTURE + DETAIL
PICTURES (Treatment A)

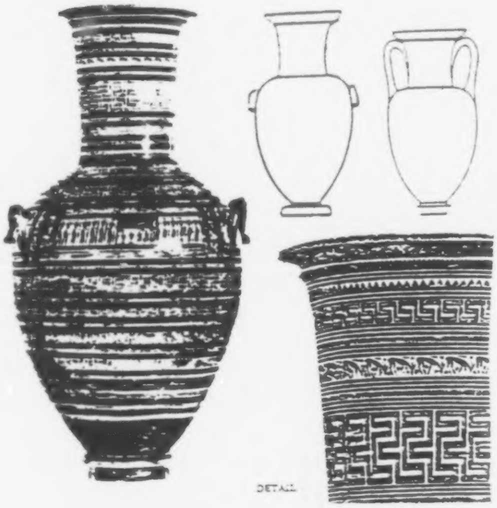
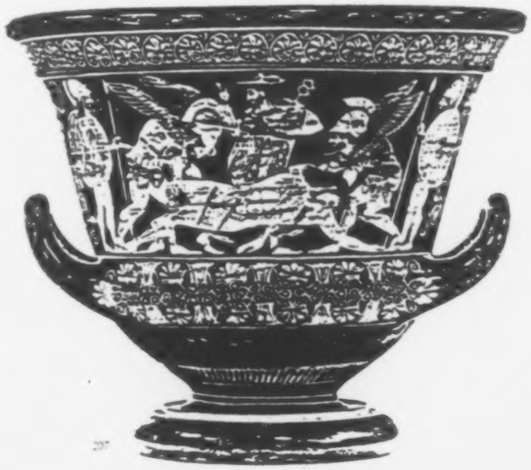


Figure 3:
SYNOPTIC PICTURE ONLY
(Treatment B)



The administration of the study took place in the same classroom settings that the students used throughout the regular academic semester. Students were instructed that they would be given twenty minutes to read and study their simulated art history textbooks (booklets). Following the reading/study exercise, all students were told that they would participate in a paper and pencil recall test (dependent measure).

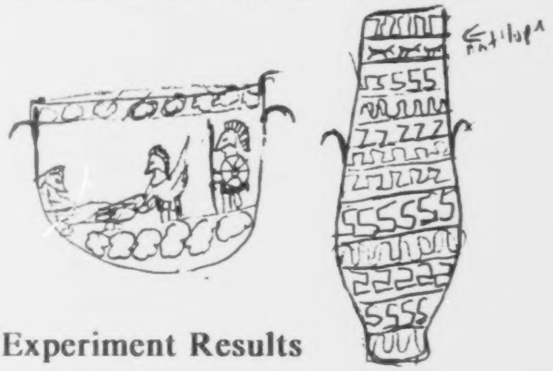
Student/subjects were specifically informed that the test they were about to take is a "test of your ability to recall certain types of visual information." They were asked to visualize the pictures of vases that they had read about, then "to the best of your ability, draw each vase as you remember it. . ." and, as quickly as you can, write down every word and/or fact that you can recall from the reading." Subjects were given twenty minutes to complete the recall test.

The drawing test results were evaluated by an independent, trained graduate student. A ten point criterion measure was provided for the evaluator.

Figure 4:
EVALUATION
CRITERIA/DRAWINGS

Overall Vase Shape	1 point
Handle Location/Depiction	1 point
Foot Detail Depiction	1 point
Neck Shape	1 point
Neck Lip	1 point
Band/Register Depiction	1 point
Internal Figure/Object Depiction	1 point
Ornament Detail	1 point
Relative Vase Sizes	1 point
Organization from Left to Right	1 point
Total per Picture Possible	10 points

Figure 5
EXAMPLES OF DRAWING RESULTS



Experiment Results

The results of the study have been reported in a separate document in four sections in accordance with the statistical procedures used to analyze the data.

In summary, the research hypothesis for this study were tested by an analysis of variance based on a 2 x 2 factorial design. Two-way ANOVAs were run on the mean scores for each of three dependent variables:

1. drawings scores;
2. verbal scores;
3. combined or total score.

The scores were the cumulative number of good responses for the paper and pencil free recall drawing measure and free recall verbal measure.

In the first of three two-way ANOVAs to test drawing scores, significant main effect was evident for the Cognitive Style independent variable F(1, 101) = 15.919 p = .0001. There was also a significant main effect for the independent variable of Picture Design Type, F(1,101) 8.744 p = .0041. As can be seen in Figure 5 there was no significant interaction effect between the two independent variables.

In the second of three two-way ANOVAs, the dependent measure was verbal score (Figure 6). The analysis of variance yielded no significant main effects for either independent variable at the .05 level. However, at a $p < .10$, a main effect of F(1,101) 3.507 is evident for the Cognitive Style variable. Again, there were no interaction effects between Cognitive Style and Picture Design Type.

Figure 6:
DRAWING SCORES:
ANOVA SUMMARY OF FINDINGS
BETWEEN SUBJECTS

Source	Mean Squares	df	F-Ratio	Prob
Cognitive Style	955.874	1	15.919	.000
Picture Design	525.020	1	8.744	.004
Cognitive Style X				
Picture Design	3.021	1	.050	.807
Within	60.04471	101		

Figure 7:
VERBAL SCORES:
ANOVA SUMMARY OF FINDINGS
BETWEEN SUBJECTS

Source	Mean Squares	df	F-Ratio	Prob.
Cognitive Style	748.368	1	3.507	.061
Picture Design	6.236	1	.029	.841
Cognitive Style X				
Picture Design	187.397	1	.878	.354
Within	213.38921	101		

The final two-way ANOVA was performed on the mean of total scores combined drawing scores and verbal scores). Based on total score, a main effect was found for the Cognitive Style variable only F(1,104) 9.381 <.05. No main effect was found for the Picture Design Type variable, and no interaction effects were determined.

In terms of drawing test scores, the null hypothesis that there is no significant difference in recall between Field-Dependent and Field-Independent cognitive styles was rejected (H_1). Likewise, the null hypothesis that there is no significant difference in recall between subjects participating in picture treatment "A" and picture treatment "B" was rejected (H_2). The null hypothesis that there would be no significant interaction between Picture Design Type and Cognitive Style (H_3) must be accepted.

Verbal score analysis suggests a different profile. Both null hypothesis (H_1) regarding cognitive style and null hypothesis (H_2) that there is no significant difference in recall between subjects participating in picture treatment "A" and picture treatment "B" were accepted. Similarly, the study fails to reject the null hypothesis that there is no significant interaction between Cognitive Style and Picture Design Type (H_3).

Figure 8 outlines mean scores and standard deviations for the three dependent variables. One-way analysis of variance was run to contrast the various cells. In regard to the free recall drawing exercise, significant differences were found between each cell causing the previously discussed main effects.

The data verifies significant differences between the Field-Independent and Field-Dependent Cognitive Styles in regard to both picture treatments.

Comparison of verbal scores yields only one difference and that is within the synoptic picture-only treatment. FI scores are significantly higher.

Figure 8:
MEANS AND STANDARD DEVIATIONS
FOR TWO RECALL MEASURES.

Cell	Criterion Measure		
Independent Variables	Drawing Recall	Verbal Recall	Total
(Cell 1) Field Dependent Synoptic Picture + Close Study	Mean = 16.6452 S.D. = 7.9396 N 31	20.0645 15.9967 31	36.7097 19.0900 31
(Cell 2) Field-Dependent Synoptic Picture + Close Study	Mean = 20.8214 S.D. = 7.9396 N 28	17.8571 10.0645 28	38.6786 15.4100 28
(Cell 3) Field-Dependent Synoptic Picture + Close Study	Mean = 22.4000 S.D. = 7.5194 N 25	22.7600 17.6376 25	45.1600 22.7050 25
(Cell 4) Field-Dependent Synoptic Picture + Close Study	Mean = 27.2524 S.D. = 7.4223 N 21	25.9524 13.5544 21	53.2143 18.4997 21

Conclusions

The results of this experiment clearly suggest that when subjects are asked to recall pictures of single objects such as the photographs of the Greek vases, most subjects can successfully execute in drawings a reasonable likeness of what they have seen. It is also apparent that subjects' performance is differentially reflected on the basis of both cognitive style and picture design factors.

Field Independent subjects demonstrated, based on their results on the drawing recall test, that they remembered a greater number of the pictured Greek vases than Field Dependent subjects. The Field Independent subjects also exhibited superior articulation of the pictured vase detail.

In terms of picture design, there was a distinct difference in performance between subjects in one treatment versus the other. Design does make a difference, but not in the direction that intuitive logic and the theoretic assumptions would have expected! Those students that received the experimental treatment that incorporated close-up photographs, outline drawings, and illustrations in addition to the synoptic pictures performed more poorly. In other words, additional pictures that made pictorial detail more salient did not enhance recall for either Field Independent or Field Dependent students.

When verbal scores are used to evaluate subject reading/study performance, the results are less definitive than the results obtained on the drawing criterion measure. In general, Field-Independent subjects again outperformed Field-Dependent subjects on the free recall verbal measure under both picture design treatment conditions.

Discussion

The finding that there is a distinct difference in performance between Field-Dependent and Field-Independent cognitive style subjects on the free recall measures that were the focus of this study is intriguing. Contrary to the idea posited by some scholars that there will be no difference in memory performance, this study's data suggests the opposite.

Although the design of the study did not accommodate an analysis of the encoding and retrieval processes postulated to be different between Field-Independents and

Field-Dependents (Goodenough, 1976), the evidence reveals differences in sheer memory output. Field-Independent subjects did achieve higher scores on both drawing and verbal tests. It can only be inferred that different information processing styles were invoked by the two cognitive style groups.

Whether the superior FI performance is the result of a more analytic, focused attention style discussed by Schmeck (1988), or an ability to impose organizational structure as suggested, is open to conjecture. The idea that Field-Independent people are more likely to impose structure on stimulus material that lacks structure would seem to have a great deal of relevance to the Art History reading/study situation. Why the close-study pictures failed to facilitate organization and structuring, as indicated by the inferior recall scores of both Field-Independents and Field-Dependents in the close-study treatment condition, is difficult to answer. However, the answer might be found in the idea of the picture as a "mediator."

Field-Independents are hypothesized to be able to make better use of mediators, and/or use mediators of their own design. In concept attainment situations, for example, the more salient cues are reportedly generally easier to learn than the less salient cues. Fleming (1968) was able to show that the Field-Dependent subject recalled fewer words than the Field-Independent subjects when the inherent hierarchial organization structure of superordinate to subordinate words was reversed. Thus, the most salient organizational cues confounded the normal learning structure, and required the subject(s) to create their own mediational devices in order to retrieve the information. The Field-Independent, it has been suggested, will be much more successful at the use of existing mediators or a design of their own. When the organization of information is already inherently highly structured, it is possible that the invocation of mediational factors becomes unnecessary. This was born out in Fleming's study when there was no significant difference shown in word recall between the Field-Dependent and Field-Independent subjects when lists were highly structured from superordinate to subordinate sequences (Witkin et al., 1977; cited by Moore, 1985). There appears to be the possibility of a parallel to those findings in this Art History reading/study experiment.

When this study was designed to accommodate the constraints of a more naturalistic experiment, the "simulated" Art History text was modified. Verbal information that is characteristically diverse in its content was adjusted to reflect descriptive information only. The expository prose quite directly described the pictured subject matter, the Greek Vases. Coupled with the concretization potentials of representational photographs, the entire prose-picture scenario may have become less abstract and conceptually ambiguous. This may have negated the need for either design imposed or self-imposed mediators, because the most salient cues were already so obvious and highly organized.

One of the contentions of the study was that while the FI subject is more capable of making use of mediators, the Field-Dependent subject would benefit the most from mediators provided by the text, graphic design variables, or pictorial cues. This effect was not evident and, in fact, the imposition of close-study pictures appeared to do just the opposite. Although the study design does not enable appropriate insight, the data suggest that close-study pictures either did not provide any facilitative effect, or they may have been deleterious to the processing of visual information.

It was believed that semantic and pragmatic emphasis factors, along with certain text parallels (Goldsmith, 1984), could be enhanced through specific design treatments. In other words, the graphic artist or instructional designer should be able to easily effect the importance of certain types of information through the use of cueing devices. A variety of "principles" from cue summation (i.e., Salomon, 1972) to the amount of visual detail provided (i.e., Nelson, Metzler & Reed, 1974) have been presented to support the "intuitive logic" of supplementing synoptic pictures with close-study pictures. Outline drawings, in particular, have been shown to be easily recalled (i.e., Ritchey, 1982) and invaluable in the emphasis of criterion exemplars as they pertain to the learning of concepts (i.e., Medin & Smith, 1984).

The results of this study contradicted many of the assumptions concerning the cue enhancing and mediational effects of pictures. Given the complete lack of facilitative effect for either Field-Dependent or Field-Independent subjects when close-study pictures were used to supplement the synoptic picture, the inclination must be to agree with the statement that memory for pictorial detail is not "invariant across all research circumstances" (Dorso & Johnson, 1980).

Summary

It is conceivable that the inclusion of detail picture cues in the form of outline drawings, illustrations, and close-up photographs simply provided unnecessary redundancy to the already obvious. Relatively straightforward photographs of the Greek vases that included the full potential of two-dimensional photographic context may have been adequate to even the most uncultivated eye. Navon (1977) postulated that the most global features are apprehended first when viewing the object; thus, it may have been most elemental to perceive of the shape of a pictured vase, recall its individual nuances, and render a simple outline drawing. Cursory analysis of the subject drawings were intriguing in this sense. The quality of the pictorial information conveyed was good. Skill, or a lack thereof, did not seem to be a problem in translating the memory vision to paper. It is apparent that the outline drawings to emphasize shape were either inappropriate cueing devices or unnecessary to the encoding and retrieval process.

Because of the degree to which the performance of subject mean drawing scores were lower in the close-study picture situation, it would appear that the interjection of additional pictures may have also provided "clutter" that interfered with visual information processing. The outline drawings that were intended to emphasize this dimension of the vases may have added superfluous detail, thereby impeding rather than facilitating increased learning (i.e., Dwyer, 1978). One could speculate that the selective attention capacity of the individual may have reached capacity (i.e., Norman & Bobraw, 1978), or that the subject had difficulty establishing time-sharing priorities relative to the amount of analysis that was required of the more numerous stimuli (i.e., Broadbent, 1971).

At the other extreme, the close-study pictures may have been taken for granted, and not attended to as an important and integral part of the reading/study exercise. The outline drawings and close-up photographs simply may have been "scanned superficially and processed at a very shallow level" (Levie & Lentz, 1982). It is possible that the "complexity" of the "untreated" pictorial subject matter was over estimated and that the learner really did not need direction in regard to attending to the critical attributes of the artwork photographs. Vase shape, for example, may be quickly and relatively easily processed perceptually.

The success of the study was its elucidation of individual differences in memory performance on the basis of cognitive style and its validation of the significance of design strategies relative to visual information processing. It is apparent that the nature of the criterion measure, in this case free recall drawing scores, has an important bearing on the direction that study results will take.

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The Appearance of Gender in Award-winning Children's Books

by Anne Drolett Creany

Gender is one of the most influential facets of human development. It affects each individual's sense of identity, interactions with others and place in society. Moments after birth, a child is labeled according to gender. As children develop, they begin to apply gender labels to themselves and also to others. Through such labeling, children begin to formulate a sense of their own gender identity. Through a process known as sex typing, a child begins to acquire the self concepts, behaviors and preferences which society defines as appropriate for members of a given gender. Those culturally determined preferences, attitudes and behaviors are referred to as sex roles, or, gender roles. When gender roles become rigid prescriptions for gender-linked behaviors, they are known as gender role stereotypes.

Gender role stereotypes act as limits to children's potential growth and development. Boys and girls may deny or suppress natural inclinations if they believe that those inclinations would make them appear unmasculine or unfeminine. Children may restrict their interests and experiences to those deemed appropriate for their particular gender by the dominant culture.

Many psychologists and sociologists agree that children assimilate gender role stereotypes through a process of socialization. Socialization is the method by which society conveys behavioral expectations to its members. (Hyde, 1986). Many socializing agents play a part in the transmission of gender role stereotypes. Parents are the first, and one of the most influential, socializing agents (Block, 1983). Peers also exert a strong influence on the assumption of gender role stereotypes. The media, especially television, has been shown to perpetuate gender stereotypes (Kalisch & Kalisch, 1984; O'Bryant & Corder-Bolz, 1978). Likewise, children's textbooks and tradebooks reflect the gender stereotypes of the culture.

Social-learning theorists note that books are important socializing agents (Mischel, 1970). Weitzman (1972) stated that picture books significantly affect early sex-role socialization because they present societal values to young children. Books are a window to the outside world, showing children how other boys and girls think, act and feel. Children also find role models in books who represent what children can and should be in their adult lives. Jalongo (1988) notes that literature is a potent force in children's lives, influencing the formation of their ideas and expectations. Literacy materials can affect children's attitudes not only about themselves but also about others.

The likelihood that books can shape children's gender role attitudes and transmit gender role stereotypes increases the need for non-sexist children's literature. However, several studies revealed the existence of sexism in children's books. Picture books, trade books, content books and basal readers were inspected for evidence of sexism. Researchers found ample evidence of sexual bias in materials written for children. Male characters are not only depicted more often than female characters, both genders are also shown in traditional, stereotyped roles (Weitzman, 1972; Scott & Feldman-Summers, 1979; Nilson, 1971). This paper will explore the appearance of gender in Caldecott Award winning picture books.

Sexism in Children's Books

Feminists on Children's Literature (1971) examined 49 Newbery Award winning books written for an elementary school age audience and found three male characters for every female. Nilson (1971) sampled 80 Caldecott Award winning picture books and Caldecott honor books published between 1950 and 1970. She concentrated on illustrated books because of their influence on young readers at an age when gender identity is forming. Nilson found that females were not only outnumbered by males but in six of the books, females were excluded. The percentage of girls portrayed in books actually fell from 46% in 1951-55 to 26% in 1966-70. Nilson acknowledges that her findings may be somewhat skewed since 19 of the 80 Caldecott books she reviewed were folktales which were created and recorded hundreds of years ago and usually depicted the exploits of men.

As she examined picture books, Nilson also noticed what she terms the "cult of the apron" (p. 918). Of 25 books picturing women, 21 showed a woman wearing an apron. Women were also illustrated as spectators of the action--looking out of windows and doorways or sitting on rockers on porches.

Weitzman et al. (1972) also noted the dearth of females in their study of 18 Caldecott Award winners and honor books from 1967-71. Even though women are 51% of the population, 23 women were pictured as opposed to 261 men. One third of the books these authors evaluated showed no women at all.

In further support of Nilson's findings, Weitzman et al. noted differentiated roles for boys and girls. Boys were independent, active, adventurous leaders, often depicted in outdoor settings. Girls, on the other hand, were passive, quiet and dependent, often depicted in indoor settings. These girls, and mothers too, were shown as anxious to please or help males. In fact, females often derived their status as the wives, mothers or daughters of important men.

Schubert (1980) examined 44 Caldecott Award winning books published between 1937 and 1980 for evidence of stereotyped roles. She limited her analysis to seven categories: 1) attractiveness as the basis for females' achievements; 2) limited aspirations and self-concept of females are accepted as the norm; 3) females, rather than males, show strong emotion; 4) females were frequently engaged in domestic duties which males did not perform; 5) males watch idly as women perform domestic duties; 6) males are shown in a wide range of occupations whereas women's occupations are very limited; and 7) only males perform brave, important deeds. Although Schubert's data are not complete enough to generalize her findings to the larger findings of picture books, she concludes that young children who are exposed to picture books receive significant reinforcement of gender role stereotypes.

Updated Analyses of Sexism in Children's Books

In the 1980's, several studies examined children's books which were published since the original research to determine whether any changes had taken place in the number of female characters or the manner in which they were represented. Engel (1981) evaluated Caldecott winner and honor books published between 1976-1980. This study showed only a slight decrease in male dominance (72%) when compared with the percentage of male characters in Caldecott and honor books published between 1966 and 1970 (74%) and 1971-1975 (78%). Engel tabulated the frequency of the encounters readers have with male and female characters in the belief that the total number of images encountered by the child reader carries more weight that just the number of the characters. Because children may get different impressions from reading the pictures alone, text alone, or a combination of the two, Engel performed separate counts for illustration and text as well as a total count for both.

Collins et al. (1984) also assessed Caldecott Award winners and honor books. Their sample included books published between 1979-1982. Compared to Weitzman's findings, this study showed that fewer sexist books are being written and that more women are appearing in titles, illustrations and major roles in children's picture books. Another update is provided by Williams et al. (1987) who examined 53 Caldecott Award winners and honor books published between 1972 and 1986. Williams found that females were significantly, more visible in picture books but that males were still more likely to be portrayed. More images of females appeared in the illustrations but only one third of the central characters are female. Most of the male and female characters in this study played traditional gender roles. Williams et al. conclude that in the picture books of the early 1980s females are not stereotyped, only "colorless".

Dougherty and Engel (1987) provide another view of Caldecott Award winners and honor books published from 1981-1985. This inspection led the authors to generalize that there is a tendency toward gender equality in picture books with males and females possessing nontraditional characteristics and playing nontraditional roles. This assertion is made despite the fact that the total number of male characters in the books studied was 206 to 153 female characters and the total number of male images was 3,063 to 1,832 female images.

Clearly, many researchers have chosen to evaluate Caldecott Award winner and honor books. Their analyses varied in methodology, the amount and type of statistics and in results. It seems reasonable to conclude, however, that the Caldecott award winning books of the 1980s offered a higher percentage of female images than did their counterparts of the 1970s. However, the gender roles played by male and female characters still reflected and thus transmitted traditional gender roles.

Are the Caldecott Award winning books published in the last decade any different? Are the roles played by males and females any more egalitarian?

Caldecott Award - winning Books Published Since 1980

Fifty-seven picture books have received the Caldecott Award or been named an honor book since 1980. (See Appendix A for a listing). Rather than relying completely upon a statistical frequency tabulation of male and female images, this analysis of gender portrayal will be somewhat holistic. Obviously, such an interpretation is weakened by its subjectivity. However, piecemeal evaluations which depend solely on male and female body counts are flawed because they may overlook the flavor and subtle nuances of a text and/or illustration.

The books published between 1980-1995 share some traits of their earlier counterparts. Male main characters still outnumber female main characters but only slightly. The main character in twenty of the books is a male; seventeen books feature female main characters.

An interesting increase in books which have both male and female figures as main characters was evident. Jumanji is an example of such a book (Van Allsburg, 1981). In this story, a brother and sister work together to complete the jungle board-game that has come to life in their living room. The sister assumes the leadership role in this dilemma.

Three of the recently published books were gender neutral, creating the possibility that readers may project whatever gender they deem appropriate on the characters. The child in In a Small, Small Pond (Fleming, 1993), the bird in Time Flies (Rohmann, 1994) and the shadow in Shadow (Brown, 1982) are all subject to speculation as to gender.

An interesting difference noted in the recent books is the portrayal of each gender. Most of the female main characters (n=17) are portrayed in a non stereotyped fashion. Only four females are portrayed as a female stereotype. Males (n=13), however, play traditional active, adventurous roles for the most part; only six males played a non stereotyped role. Ten, Nine, Eight (Bang, 1983) is an example of the latter. In this counting book a father tenderly helps his daughter get ready for bed.

Another difference in recent Caldecott award winning books is evident in folktales. Seventeen of the fifty-seven Caldecott award winning books published since 1980 are folktales. This represents almost one-third of the books, a higher number than Nilson reported.

Folktales typically provide a traditional portrayal of males and females but several of the folktales examined here do not adhere to stereotyped portrayals. For example, the character of Magic Frog in The Story of Jumping Mouse (Steptoe, 1984) is a powerful figure who grants Jumping Mouse a gift which assists him in attaining his dream and ultimately rewards him for his courage and kindness to others. It is interesting to note that if this book was analyzed by a frequency count, we would see that Magic Frog, a female, is a secondary character who is out numbered by male characters at least 4-to-1 and would fail to recognize this as a nonsexist book. The character of Jumping Mouse is also a rather nontraditional male figure; he is a dreamer who is very empathic toward the plight of others.

Other folktales feature female main characters who do not fit the mold of passive girls who are rewarded for their beauty and their obedience. For example, in Lon Po Po: A Red Riding Hood Story from China (Young, 1989) the three sisters outwit the wolf themselves, in contrast to Grimms' version wherein the woodcutter rescues both grandmother and child.

Similarly, Mufaro's Beautiful Daughters, (Steptoe, 1988) is often described as an African Cinderella tale. In this story, the king's heart is won by the daughter who is kind and generous. Both daughters are beautiful; their temperaments set them apart. In the Creole tale, The Talking Eggs (Sans Souci, 1989), kindness, the keeping of promises and courage are rewarded with riches. There are no male characters in this book.

In fiction, as in folklore, female characters are less passive and inactive. The Grey Lady eludes the strawberry snatcher with determination, good humor and cleverness. (Bang, 1980). Cassie flies through the air in Tar Beach (Ringold, 1991), claiming the Brooklyn bridge for her own. The daughter of a migrant family helps her parents as they work in the fields in Working Cotton(Williams, 1992). In Mirette on the High Wire, (McCully, 1992) Mirette walks a tightrope stretched across a Parisian street. Interestingly, the artists depict the female characters in the above-mentioned books wearing dresses even though escaping, flying, working in fields and walking tightropes don't lend themselves to such clothing.

Clearly, more female characters in award-winning picture books are behaving actively and adventurously even if few male characters are adopting traditional female traits. Perhaps the tendency to assign active, adventurous roles to both males and females substantiates the claim made by Bauer (1993) that current challenges to sexism frequently consist of choosing stories in which girls are not just "as good as" but actually "just like" boys. Bauer suggests that the female experience is equally valid and important and worth being taken seriously.

If, as Bauer suggests, balanced numbers of male and female characters and active roles played by both genders are not a sufficient indication of nonsexist literature for children, what criteria should parents/educators employ in evaluating books? Rudman (1995) proposes the following guidelines:

*characters should be individuals, consistent with their character development and the story's plot;

*occupations should be gender free;

*achievements should be judged independently of gender

*adults should function as parents and breadwinners in some stories

*clothing should be functional and appropriate

*females should not always be weaker or smaller

* language should be gender fair

Adults should not approach evaluation criteria or critical reviews of children's books as a rationale for preventing children's access to certain books. Instead, both children and adults should be invited to examine and discuss their own gender stereotypes. Care should be taken to provide a beautifully written and illustrated collection of literature which will offer a balanced representation of genders and gender behaviors and roles to serve as models for children.

Appendix A

Caldecott Award winning books and honor books

(*) Indicates books cited in paper

1981 Caldecott Award

Fables by Arnold Lobel. Harper.

Honor Books

The Bremen-Town Musicians retold and illustrated by Ilse Plume. Doubleday.

The Grey Lady and the Strawberry Snatcher by Molly Bang. Four Winds.*

Mice Twice by Joseph Low. Atheneum.

Truck by Donald Crews. Greenwillow.

1982 Caldecott Award

Jumanji by Chris Van Allsburg. Houghton Mifflin. *

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Honor Books

A Visit to William Blake's Inn: Poems for Innocent and Experienced Travelers by Nancy Willard. Illustrated by Alice and Martin Provensen. Harcourt Brace

Where the Buffaloes Begin by Olaf Baker. Illustrated by Stephen Gammell. Warne.

On Market Street by Arnold Lobel. Illustrated by Anita Lobel. Greenwillow.

Outside Over There by Maurice Sendak. Harper.

1983 Caldecott Award

Shadow by Blaise Cendrars. Translated and illustrated by Marcia Brown. Scribner's.*

Honor Books

When I Was Young in the Mountains by Cynthia Rylant. Illustrated by Diane Goode. Dutton.

A Chair for My Mother by Vera B. Williams. Greenwillow.

1984 Caldecott Award

The Glorious Flight: Across the Channel with Louis Bleriot, by Alice and Martin Provensen. Viking.

Honor Books

Ten, Nine, Eight by Molly Bang. Greenwillow. *

Little Red Riding Hood by the Brother's Grimm. Retold and illustrated by Trina Schart Hyman. Holiday House. *

1985 Caldecott Award

Saint George and the Dragon adapted by Margaret Hodges. Illustrated by Trina Schart Hyman. Little, Brown.

Honor Books

Hansel and Gretel adapted by Rika Lesser. Illustrated by Paul O. Zelinsky, Dodd.

The Story of Jumping Mouse retold and illustrated by John Steptoe. Lothrop.*

Have You Seen My Duckling? by Nancy Tafuri. Greenwillow.

1986 Caldecott Award

The Polar Express by Chris Van Allsburg. Houghton Mifflin.

Honor Books

The Relatives Came by Cynthia Rylant. Illustrated by Stephen Gammell. Bradbury.

King Bidgood's in the Bathtub by Audrey Wood. Illustrated by Don Wood. Harcourt.

1987 Caldecott Award

Hey, Al by Arthur Yorinks. Illustrated by Richard Egielski. Farrar.

Honor Books

The Village of Round and Square Houses by Ann Grifalconi. Little, Brown.

Alphabatics by Suse MacDonald. Bradbury.

Rumplestiltskin by the Brother's Grimm. Retold and illustrated by Paul O. Zelinsky. Dutton.

1988 Caldecott Award

Owl Moon by Jane Yolen. Illustrated by John Schoenherr. Philomel.

Honor Books

Mufaro's Beautiful Daughters retold by John Steptoe. Lothrop. *

1989 Caldecott Award

Song and Dance Man by Karen Ackerman. Illustrated by Stephen Gammell. Knopf.

Honor Books

Free Fall by David Wiesner. Lothrop.

Goldilocks and the Three Bears retold and illustrated by James Marshall. Dial.

Mirandy and Brother Wind by Patricia McKissack. Illustrated by Jerry Pinkney. Knopf.

The Boy of the Three-Year Nap by Diane Snyder. Illustrated by Allen Say. Houghton Mifflin.

1990 Caldecott Award

Lon Po Po: A Red Riding Hood Story from China translated and illustrated by Ed Young. Philomel. *

Honor Books

Hershel and the Hanukkah Goblins by Eric Kimmel. Illustrated by Trina Schart Hyman. Holiday House.

The Talking Eggs adapted by Robert D. San Souci. Illustrated by Jerry Pinkney. Dial. *

Bill Peet: An Autobiography by Bill Peet. Houghton Mifflin.

Color Zoo by Lois Ehlert. Lippincott.

1991 Caldecott Award

Black and White by David Macaulay. Houghton Mifflin.

Honor Books

Puss'n Boots by Charles Perrault. Illustrated by Fred Marcellino. Farrar.

"More, More, More," Said the Baby: 3 Love Stories by Vera B. Williams. Greenwillow.

1992 Caldecott Award

Tuesday by David Wiesner. Clarion.

Honor Books

Tar Beach by Faith Ringgold. Crown.*

1993 Caldecott Award

Mirette on the High Wire by Emily Arnold McCully. Putnam. *

Honor Books

Seven Blind Mice by Ed Young. Philomel.

The Stinky Cheese Man & Other Fairly Stupid Tales by Jon Scieszka. Illustrated by Lane Smith. Viking.

Working Cotton by Sherley Anne Williams. Illustrated by Carole Byard. Harcourt. *

1994 Caldecott Award

Grandfather's Journey by Allen Say. Houghton Mifflin.

Honor Books

Peppe the Lamplighter by Elisa Bartone. Illustrated by Ted Lewin. Lothrop.

In the Small, Small Pond by Denise Fleming. Holt. *

Owen by Kevin Henkes. Greenwillow.

Raven: A Trickster Tale from the Pacific Northwest by Gerald McDermott. Harcourt.

Yo! Yes? by Chris Raschka. Orchard

1995 Caldecott Award

Smoky Night by Eve Bunting. Illustrated by David Diaz. Harcourt.

Honor Books

Swamp Angel by Anne Isaacs. Illustrated by Paul O. Zelinsky. Dutton.

John Henry by Julius Lester. Illustrated by Jerry Pinkney. Dial.

Time Flies by Eric Rohmann. Crown.

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The Impact of Line on Perceptions of An ID Process Model

Landra L. Rezabek & John J. Cochenour

Background and Rationale

During years of teaching principles of instructional design (ID) to graduate and undergraduate education majors, the authors have noted that, when initially presented with models that use rectangles and straight lines to visualize the process (e.g. Dick & Carey, 1990; Seels & Glasgow, 1990; Smith & Ragan, 1993), students' first impression of the ID process is that it is rigid, inflexible, fixed, and perhaps not very relevant for use in a real-world K-12 classroom. However, when students have first been introduced to Kemp's circular model (Kemp, 1985; Kemp et al., 1994), students' initial perceptions of the ID process are that the process is somewhat flexible and adaptive and may be beneficial to them as teachers. Kemp himself indicates (Kemp, 1985, p. 12; Kemp et al., 1994, p. 10) that his choice of a circular model was chosen to visually emphasize the flexibility of his approach to instructional design.

From the perspective of visual communication, vertical and horizontal lines, squares, and blocks are associated with feelings of stability and stasis while circular forms and curved lines imply movement, motion, and dynamism (Dondis, 1973; Heinich, Molenda, & Russell, 1993). If, when working to encourage teachers to use an instructional design model as a flexible framework for designing good instruction and not as a lock-step, rigid format to be followed without integrating one's own professional expertise, then the manner in which an instructional design model is visually depicted becomes an important instructional consideration. Students' perceptions of the instructional design process itself may be heavily influenced by the way in which ID models are visually depicted.

In thinking about students' potential perceptions of both the process of instructional design and the models used to visualize it, the authors identified three factors of primary interest: flexibility, organization, and value. Flexibility, used in the context of this study, is the characteristic of the ID process or model that indicates the degree to which it is responsive to being adapted or changed. Organization, as defined by the authors, is the characteristic of the ID process or model that indicates the manner of relationship among the process/model elements, the overall structure and pattern of the process/model, and the logic, meaning, and clarity of that pattern. Value is the characteristic of the ID process or model that indicates the degree of usefulness or importance.

This is the seminal investigation in a planned series of investigations and, as such, the major goal was to determine if the way in which the instructional design process is visually depicted by a two-dimensional model influences preservice teacher perceptions of the flexibility, organization, and value of the ID process itself.

Research Questions

As indicated above, this study was designed to investigate the influence of the visual display of an instructional design model on preservice teachers' perceptions of the instructional design process. The overall research hypotheses included the following:

1. Providing preservice teachers with information about the instructional design process will increase their perceptions of the flexibility, organization, and value of the process.

2. Preservice teachers will perceive the ID process to be more flexible when a curved/oval model is used to visually represent the process than when a straight/rectangle model is used.

3. Preservice teachers will perceive the ID process to be no more or no less organized when a curved/oval model is used to visually represent the process than when a straight/rectangle model is used.

4. Preservice teachers will perceive the ID process to be more valuable when a curved/oval model is used to visually represent the process than when a straight/rectangle model is used.

5. Prior experience with ID, prior experience teaching, anticipated teaching level or content, year in college, and gender will have no effect upon preservice teachers' perceptions of the flexibility, organization, or value of the ID process as visually depicted by either curved/oval or straight/rectangle models.

Additionally, the authors were interested in assessing preservice teachers' general reactions to the instructional design process. Study participants were asked to respond to the following:

6. List any other words to describe how you feel about the instructional design process.

7. Which model do you think best represents what happens in the instructional design process?

8. If you were going to teach some of the principles of the instructional design process to someone else who was planning to be a teacher, which model would you show to the other person as you explained the instructional design process?

Methodology

Forty-six undergraduate education majors enrolled in an introductory education class during the Spring 1995 semester at an institution in the Rocky Mountain west participated in this study. Twenty-nine (63%) female students and 17 (37%) male students completed the data collection instruments. As a group, they had completed an average of 13.13 years of schooling and represented a wide range of teaching levels and content areas. Nineteen (41%) had taught in some capacity before, whether in a traditional classroom or as an aide, coach, community service volunteer, or religious education instructor. None had any experience with the instructional design process.

The students were assessed on their initial knowledge and perceptions of the ID process. The assessment included a self-report of demographic and experiential characteristics including prior experience with instructional design ("none" or "some") and a 26-item, 5-point Likert-type scale on which students indicated the degree to which they felt one or the other of a particular set of antonyms described their feelings about the ID process (See Figures 1, 2, and 3). Students were then given a three hour introduction to instructional design as part of a standard curriculum. During this period of direct oral instruction over the material, students received a printed outline of the "steps" in the Smith-Ragan (1993) ID model but no visual representation of the model. After instruction, students' perceptions of the ID process again were assessed using the 26-item Likert-type scale. After this posttest, students were given first one and then the second of two visual depictions of the Smith-Ragan ID model. One model was drawn with curved lines and ovals and the other original model was formed with straight lines and rectangles. The layout, size, font styles, and other visual elements remained constant between the two models (See Figures 4 and 5).

Figure 1
Flexibility Antonym Pairs

Word Pairs:
Flexibility Characteristic

structured-------unstructured
inflexible-------------flexible
rigid-----------------adaptable
firm-----------------malleable
regulated-----------sporadic
unyielding----------yielding
exacting ---------modifiable
fixed------------------pliable
constant -----------changing

Figure 2
Organization Antonym Pairs

Word Pairs:
Organization Characteristic

linear---------------circular
abstract------------concrete
random----------sequential
inconsistent-----consistent
informal-------------formal
irrational-----------rational
misleading------------clear
complicated---------simple
disorganized----organized
unplanned---------planned
haphazard-----methodical
disorderly----------orderly

Half of the students were given the curved/oval model first and then completed the 26-item assessment and one question

Figure 3
Value Antonym Pairs

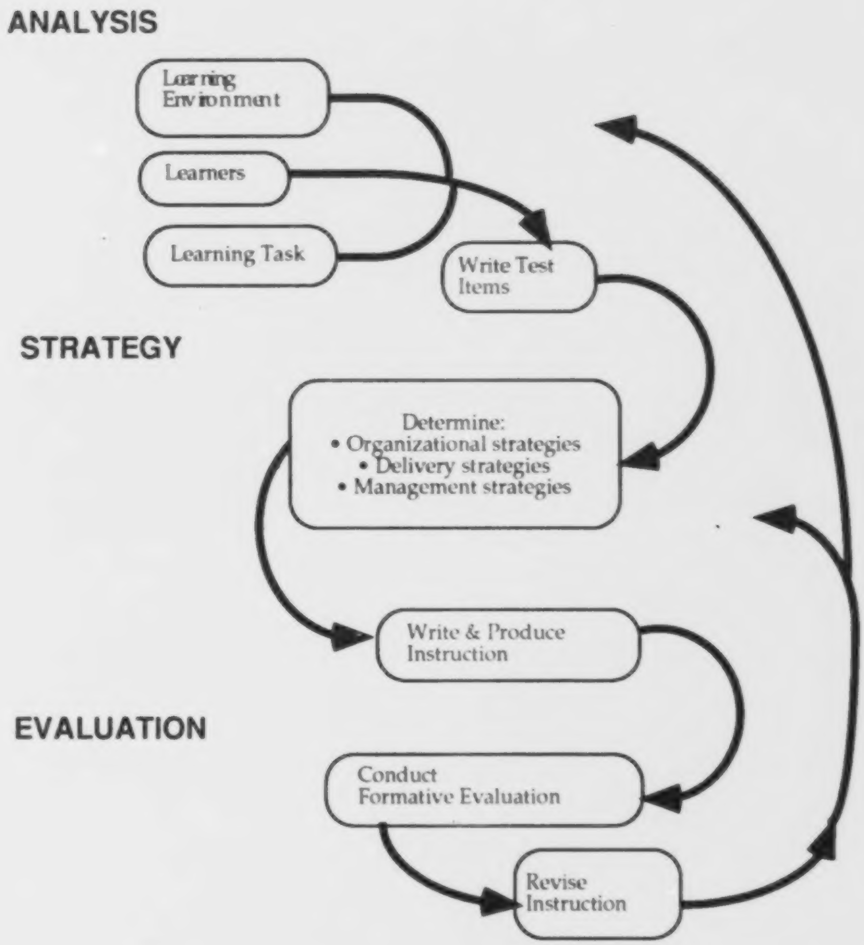
Word Pairs:
Value Characteristic

unhelpful---------helpful
difficult--------------easy
confusing---------logical
foolish-----------sensible
worthless-------valuable

Figure 4
Curved/Oval ID Model

INSTRUCTIONAL DESIGN PROCESS*

Model A

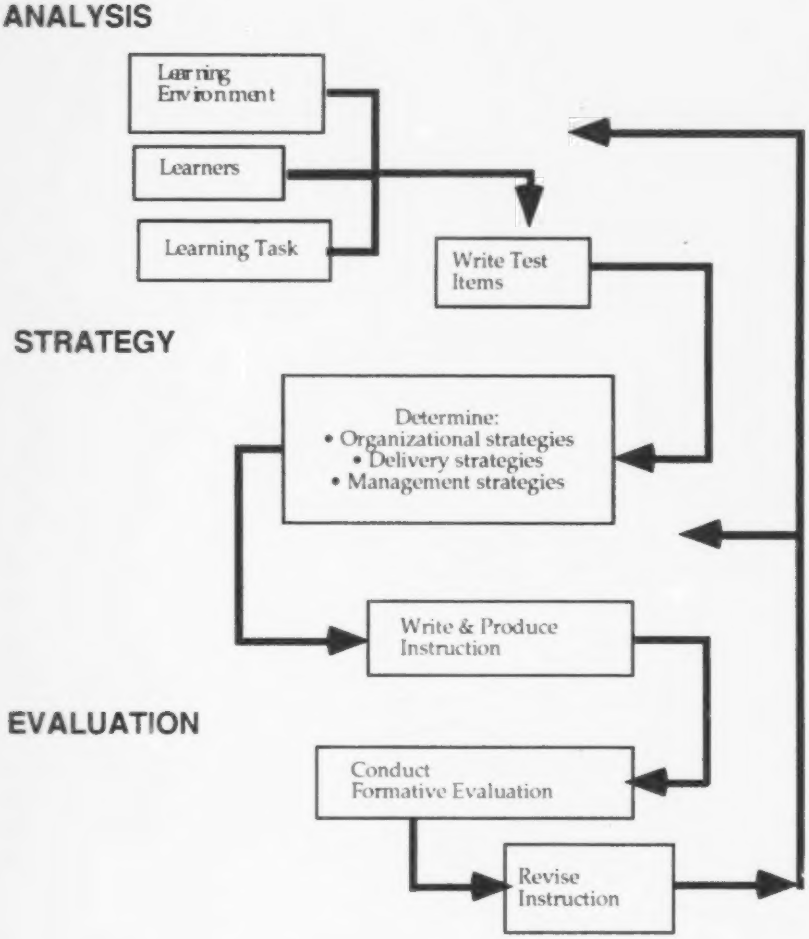

ANALYSIS
Learning Environment
Learners
Learning Task
Write Test Items
STRATEGY
Determine:
• Organizational strategies
• Delivery strategies
• Management strategies
Write & Produce Instruction
EVALUATION
Conduct Formative Evaluation
Revise Instruction

*Adapted from Smith, P. L. & Ragan, T. J. (1993) *Instuctional Design*. New York: Merrill

Figure 5
Straight/Rectangle ID Model

INSTRUCTIONAL DESIGN PROCESS*

Model B


ANALYSIS
Learning Environment
Learners
Learning Task
Write Test Items
STRATEGY
Determine:
• Organizational strategies
• Delivery strategies
• Management strategies
Write & Produce Instruction
EVALUATION
Conduct Formative Evaluation
Revise Instruction

*Adapted from Smith, P. L. & Ragan, T. J. (1993) *Instuctional Design*. New York: Merrill probing for any other words they associated with instructional design process. The model and responses were collected and students then viewed the straight/rectangle model and answered the same 26 response items and follow-up question while referring to the second visual. The remaining half of the students were presented with the visual models in the reverse order. After viewing both models, all students were ask to specify which model (curved or straight) best represented what "happens" in the instructional design process and which of the two models they would use if they were teaching the ID process to someone else who was planning to be a teacher.

Results

Preliminary data analysis suggests that the visual display of the instructional design model indeed influenced student perceptions of the instructional design process, though difficulties in data entry and confounding effects discovered in the data collection procedures discussed below have delayed analysis of some of the results. Although the data analysis is not yet complete, results and trends which appear to be valid are presented below.

Regarding Question 1, a paired two-sample for means t-test is significant at the .05 level. This suggests that preservice teachers did show a change in their responses between the pretest and the posttest assessing their perceptions of the flexibility, organization and value of the instructional design process, though current data do not yet suggest where these changes occurred. On the posttest, respondents were highly consistent in choosing the terms *sensible* and *valuable* to describe the ID process, both terms with means in excess of 4.5 on a 1 to 5 scale.

Initial quantitative analysis has not shown significant differences in any of the remaining questions, but this work has only begun due to the recent recognition of a coding error discovered during data entry. In observing the responses to the word pair choices describing the two ID models, respondents tended to be very neutral. There was no significant deviation from the central choice (3) in most cases.

In analyzing the open-ended responses, the researchers were again overwhelmed by the amount and complexity of the data. However, throughout this initial phase of data analysis, interesting as well as inexplicable patterns have emerged. This portion of the data analysis focused specifically on student responses to the following statements that related specifically to Questions 6 through 8 above:

A. When you look at **Model A** [whichever was the first model presented], list any other words to describe how you feel about the *instructional design process*.

B. When you look at **Model B** [whichever was the second model presented], list any other words to describe how you feel about the *instructional design process*.

C. Which model do you think best represents what happens in the instructional design process? Explain why you feel this way.

D. If you were going to teach some of the principles of the instructional design process to someone else who was planning to be a teacher, which model would you show to the other person as you explained the instructional design process? Explain why you feel this way.

E. Please feel free to make any additional comments you wish to share.

Thus far, demographic and experiential characteristics of the students do not appear to influence responses to any of the questions posed above. Student responses to Questions A and B above are summarized in Figure 6. Though data were summarized in a manner to observe any influence caused by the order in which the students viewed the models, presentation order does not appear to influence these responses. Student-generated words used to describe the *instructional design process as depicted in the curved/oval model* included the terms orderly, confusing, smooth, overwhelming, adaptable but structured, time consuming but valuable, out of order, easier to comprehend, and easier to follow. Quite similarly, student-generated words used to describe the *instructional design process as depicted in the straight/rectangle model* included the terms orderly, confusing, flows smoothly, overwhelmed, organized but adaptable, time consuming but valuable, chaotic, understandable, and straightforward. Overall, the same words or those with similar meanings were used to describe both the positive and negative aspects of the instructional design process regardless of

Figure 6
Words Chosen to Describe the ID Process

Model Selected	Model Viewed First ○	Model Viewed First □
○	• Good framework • Worthwhile process • Orderly • Very prepared • Cyclical effect • Learning • Out of order • Overwhelming • Too many paths • Confusing • Lost running in circles	• Easier to comprehend • Smooth • Confusing • Easier to follow • Constant learning process • Adaptable, but structured • Time consuming, but valuable
□	• Cognitive flow chart • Too concrete for my thinking style • Overwhelmed • Difficult to follow • Chaotic • Confusing • Looks complex, but isn't • Organized, but adaptable • Not enought flexibility •Time consuming, but valuable	• Strict •Straightforward • Arranged • Structured • Square • Orderly • Direct approach • Learning • Revise • Flows smoothly • Organized • Visually clear • Understandable
Neither	No Comments	

whether curved or straight lines were used to visually depict the model. In addition, similar or the same words were not necessarily provided by the same students.

In thinking about Question C above, Figure 7 presents the number of students who indicated a preference for either the circle, the square, or neither model as the best representation of what happens in the instructional design process. Descriptive statistics indicate that, of the 46 preservice teachers, 21 students (46%) believed that the curved/oval model best represented the ID process, 18 students (39%) believed that a straight/rectangular models best did so, and 7 students (15%) believed neither model was better. When the curved/oval (circle) model was viewed first by 21 students, 6 students (29%) indicated that it was the best model, 14 students (67%) indicated that the straight/rectangle (square) model was the best, and 1 student (5%) indicated neither was better. When the straight/rectangle model was viewed first by 25 students, 15 students (60%) indicated that the curved/oval model was the best, 4 students (16%) indicated that the straight/rectangle model was best, and 6 students (24%) indicated that neither was better. Overall, the second model to be viewed tended to be chosen as the best model, regardless of the order in which the models were presented.

Figure 7
Number of Students Selecting Each Model as "Best"

	Model Viewed First	
Model Selected	○	□
○	6	15
□	14	4
Neither	1	6

Figure 8
Number of Students Selecting Each Model as "Choice to Use to Teach"

	Model Viewed First	
Model Selected	○	□
○	7	16
□	14	4
Neither	0	5

Data relating to Question D above are presented in Figure 8. In a similar manner to the data collected for Question C, descriptive statistics indicate that of the 46 preservice teachers, 23 students (50%) believed that they would use the curved/oval model to teach the ID process, 18 students (39%) believed that they would use the straight/rectangle model to do so, and 7 students (11%) had no preference for use. When the curved/oval (circle) model was viewed first by 21 students, 7 students (33%) indicated that it was the model they would use, 14 students (67%) indicated that they would use the straight/rectangle (square) model , and no students responded that they had no preference for use. When the straight/rectangle model was viewed first by 25 students, 16 students (64%) indicated that the curved/oval model was the one they would use, 4 students (16%) indicated that the straight/rectangle model was the one they would use, and 5 students (20%) indicated that they had no preference for use. With overall data strikingly similar to those collected for Question C, the second model viewed, regardless of whether it was curved/oval or straight/rectangle, typically was chosen as the best model—again, regardless of the order in which the models were presented. Additionally, though students strongly tended to select the same model as the "best" one and their "choice to use to teach," this was not always the case.

Data displayed in Figures 9 and 10 also provide insight into the students' perceptions of the "best" and "choose to use to teach" models as they provide verbal explanations of their decisions. Again, the order of presentation did not appear to affect the terms chosen to describe student reasoning behind their preferences. As depicted in Figure 9, regardless of whether it was presented first or second, if the curved/oval model was preferred, the most common reasons included that it was more flexible, more modifiable, and more adaptable.

Figure 9
Reasons Underlying Preference for "Best" Model

Model Viewed First

Model Selected	○	□
○	• More flexible • Easy to modify • Not as fixed • Not so strict • More like a tool • Not set in stone • Not so confusing	• More circular—how I see the process • Easier to follow • Flowed smoothly • Flexibility in design • More pliable instead of fixed • More modifiable • More adaptable • More flexible
□	• More straightforward • More organization • More direct • Easier to understand • Easier to follow • More structured • Easier to visualize what happens •More easily changed & manipulated • More logical	• More like circuits in electricity • More organized • Don't like curved lines • More specific
Neither	No Comments	

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Figure 10

Reasons Underlying Preference for "Choice to Use to Teach" Model

Model Selected	Model Viewed First: ○	Model Viewed First: □
○	• More malleable • Not as fixed • Reflects flexibility • More laid back • Explains what you want	• More changeable • More practical • Not so set • Flexibility in design • More pliable • Less fixed • Easier to understand • Flows better • More inviting • Less confusing • More personal preference
□	• More organized • More specific • Don't like curved lines • Circut could be modified • Clear • Specific	• Clearer • More professional • Straightforward • More structured • Order of events • Explains process better • Less confusing • Better understood • More organized • Easier to follow
Neither	No Comments	No Comments

Regardless of whether the straight/rectangle model was viewed first or second, it was described as more organized, easier to follow, and easier to understand. No comments were made if students did not perceive one model as better than the other. In a similar manner, results displayed in Figure 10 indicate that the order of presentation did not appear to affect students' choice of words generated to describe their preference of one model or the other that they would chose to use when teaching someone about ID. Whether presented first or second, the curved/oval model was perceived as more malleable, not as fixed, more flexible, easier to understand, and more flowing. Again regardless of presentation order, the straight/rectangle model was perceived as more organized, more clear, more structured, easier to understand, and easier to follow. Students who selected no model preference indicated that they would integrate the use of both models but did not supply additional words to describe the models.

Discussion and Recommendations

Regarding Question 1, data indicate that preservice teachers changed their responses between the pretest and posttest assessing their perceptions of the flexibility, organization, and value of the ID process. Though the data analysis is not complete, student indications that ID is perceived as sensible and valuable comfort the researchers, who believe that the ID process indeed is worthwhile to teach to these preservice teachers. Researchers are concerned about the significance and discriminative value of the some of the additional terms selected for use in the data collection instrument and will continue to refine it.

Questions 2, 3, and 4 are not supported or refuted by quantitative data at this point in the study. Researchers' "gut reaction" remains that the visual display of the ID process does in some way influence preservice teachers' perceptions of the flexibility, organization, and value of the ID process itself, but refinement to the instrument and continued investigation are needed.

In considering Question 5, open-ended responses indicate that the demographic and experiential characteristics of the students that were selected for this study may not be as influential in determining student preferences as other factors not yet investigated. Among some of the additional characteristics possibly influencing preservice teachers' perception of the ID process itself and the way in which it is visually depicted include individual learning style preferences; cognitive style factors such as locus of control and field dependence/independence; educational background such as electrical engineering training or experience in reading other types of flowcharts; individual preference for structure or flexibility; and personal visual appeal. In conjunction with data collected to address Question 6, this observation is supported by the similarity between the words students consistently generated to describe both the curved/oval model and the straight/rectangle model and the ID process itself. Apparently, student characteristics other than those identified have a greater impact on their perceptions of the ID process and the visual representation of the model, and this is an area for continued investigation.

With regard to Questions 7 and 8, the fact that students consistently identified the second model that they saw as both the "best" and the "choice to use to teach" indicates a possible problem in the data collection procedures. The first model was collected with student response sheets after students had completed them to prevent students from referring to their previous answers. However, in doing so, students apparently "forgot" how the first model looked and tended to prefer the second model, perhaps solely because they could refer to it while answering the questions. Future iterations of this study will allow students to keep both their models and their response sheets while completing the entire package of materials.

Also with respect to Questions 7 and 8, current data analysis does not indicate whether a slight student preference to identify the curved/oval model as "best" as well as the "choice to use to teach" is statistically significant. Because of the apparent flaw in data collection procedures mentioned above, these current data will not be used in upcoming iterations of the study and researchers chose not to expend the considerable amount of time needed to further analyze these current results.

The importance of the visual display of ID models for professionals teaching the instructional design process is summarized by two very different quotations from two sophomore students, both of whom had no preference for a "best" or "choice to use to teach" model. One student lamented: "I understand the presentation that you gave and it was very helpful . . . but I don't get these dang models!" This comment underscores the importance of presenting a visual representation of the ID process that facilitates—not hinders—students' acquisition of the principles underlying the instructional design process. Numerous comments also could be cited to support the observation of students' preferences of models based on their own personal preferences for structure or flexibility. However, one very astute student concluded: "The only difference is the lines as far as I could see. To me lines that are curved or lines that are straight still point to the same thing. . . . Curved lines may indicate flexibility & straight lines more structure & less variance. I look at the design as both flexible & structured." Since this is one of the key messages regarding the instructional design process that the researchers attempt to convey to preservice teachers, perhaps preservice teachers should be introduced to both curved/oval and straight/rectangle visualizations of the ID process. This study has generated more questions than it has answered, and the question of the impact and importance of the visual display of an ID model on student perceptions of the process itself remains a viable area for additional research.

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From Aristotle to Disney World: Cinematic Paradigms and Perceptual Shifts

by Ann Marie Barry

In Paris in 1895, Louis Lumière, together with his brother Auguste, was the first to screen film for a paying audience. His new invention–the Cinématographe–combined a camera and projector within one unit and delighted viewers with the novelty of scenes of the daily life around them, with what Kracauer called the motion picture camera's ability to "record and reveal physical reality," catching the transient stuff of life "on the wing."[1] His films were short, showing brief episodes: workers leaving the Lumière Factory in Lyon, a train arriving at the station, Auguste helping to feed his baby, a gardener being tricked by a boy and splashed with a hose. His contemporary, Georges Méliès saw in film not the magic *of* everyday life, but the possibilities of incorporating magic *into* it.

An inveterate showman, Georges Méliès developed his own device for recording and displaying films and exploited the theatrical appeal of the new medium, quickly recognizing that the camera could be stopped and started again, making it the equivalent of the trap doors of the stage illusionist. By 1902 Méliès had produced what is today his best known film, "A Trip to the Moon," filled with disappearing imps, imaginative illusions and delightful humor. He was the first to use stop-motion special effects, artificial lighting, time-lapse photography, and even the first complex multiple exposure. But perhaps nothing makes the contrast between their approaches clearer than two coronation "newsreels": Lumière's film representatives in Russia filmed the real coronation of Czar Nicholas in order to awe distant audiences; Méliès simply "recreated" the coronation of England's Edward VII in his studio *before* the event actually took place.

Together, Lumière and Méliès represent what many film theorists see as the contrary direction of film aesthetics: on the one hand, film may be seen as a tool for realism and a medium where life may be revealed and discovered; on the other, film appears as a twilight place, what Hawthorne saw in the literary romance, as "a neutral territory somewhere between the real world and fairy-land, where the Actual and the Imaginary may meet, and each imbue itself with the nature of the other."[2]

Today these divergent film tendencies of reality and imagination are converging into the total sensual-surround experience of the virtual reality movie ride–the newest direction in visual entertainment. Accompanying this transformation is a significant perceptual paradigm shift which signals a change not only in the way in which we experience film itself, but which also in turn brings about a shift in the way we perceive the world around us. This paper contrasts classical Aristotelian narrative which encouraged intellectual reflection and came to dominate Hollywood film by the 1930s, with the pulsating images which began to appear in films as a result of the influence of television's MTV on film editing and styles of viewing in the mid 1980s, and looks ahead to the future of film as total sensual immersion. Specifically it will focus on the contrast between two major Hollywood films: *Grapes of Wrath* (U.S.A., 1940) and *Top Gun* (U.S.A., 1986) which represent significant differences in the way we view film and life itself–beginning with the birth of film as art and evolving along a developmental time continuum spaced approximately four and a half decades apart.

Grapes of Wrath, directed by John Ford, is a film made in what has come to be known as the classical Hollywood style. By the 1930's, as film developed into a glamorous and powerful industry, the big Hollywood studios were in place and working full time in almost assembly line fashion to produce films within a formulaic approach, which stressed verisimilitude, character identification and development, and a style of film making evolved from the early work of such monumental figures as D.W. Griffith, which anticipated perceptual process and conformed to classical Aristotelian plot structure in its narrative techniques.

Aristotelian narrative structure is what most of us tend to think of as natural story form–i.e., things seem to happen or unfold in an orderly progression from one event to the next in a sequence which has a beginning, middle and end, in that order. In the typical Aristotelian plot, action moves from a state of equilibrium into rising action by the intervention of an inciting incident which establishes a conflict. This conflict becomes more and more intense until it reaches the point where it must be resolved one way or another at a point of climax. Then the consequences of this are shown, the loose ends are wrapped up, and a new balance is achieved. Events from the beginning cause those in the middle and those in the middle cause those in the end. All action, however, ultimately stems from the characters themselves, and in the course of the action, we will come to realize some truth about the nature of humanity or the course of existence. We emerge wiser because as we identify with the protagonist, our own problems and emotions find a cathartic outlet and the vicarious experience, lived through the insight of the author, is structured to bring us to new awareness.

Although this experience is what we're used to expecting in film and in literature, it, of course, is not the way real life is. Real life is chaotic: we are continually bombarded with stimuli demanding our attention, and incidents seldom have true beginnings, middles, and ends. Although life in film and in literature seems coherent and logical, the real life were are immersed in seldom makes such perfect sense, and rarely do incidents occur with their immediate meaning and long-term significance so apparent or simple. One of the functions of art as it is classically defined is to help us do this–to see the deeper meaning and larger pattern of events within our own lives as well.

In classical Hollywood cinema, which came into its own in the 1930s and 40s, the camera aids us in this. The editing is seamless and the camera acts like a pointing finger to guide us through events by directing our attention to what is important. Narrative is always developed linearly in a clear cause and effect line, and character becomes the cause of events, moving the action forward as a result of internal motivation and turmoil. Anticipating the way we observe life around us, the camera moves in as we come to understand the context for the action and become interested in the characters themselves. As the action moves forward, we have time to reflect upon it and the themes which it reveals, and in the process the "invisible" editing of the Hollywood style always moves us seamlessly from outside appearances to inward revelations of the internal struggle within the characters. As we move into the mind and heart of the protagonist we come to identify with him or her, and once this identification is established, we then begin to view the world through his or her perspective, coming to understand how that character relates to the world and is impacted by it.

In *Grapes of Wrath*, based on John Steinbeck's novel, we are introduced to the Joad family which, because of drought and foreclosure by the banks, is dispossessed of its land. Its subsequent journey to California and the brutal economic exploitation which it finds there not only mirrored the experience of many Oklahoma farmers in the 1930s "dust bowl" migration, but also spurred an awareness of social injustice with which many more people could and did identify. Many sociologists believe, in fact, that were it not for the onset of World War II–so powerful was narrative impact and so dire was the widespread human plight which it revealed–the novel and the film might together have caused massive social upheaval and even political revolution.

The script, the camera and editing conspire in creating this impact. In the first six minutes of Ford's film, we move inexorably forward and inward, from the extreme long shot which establishes the dust bowl environment, to a long shot of the cafe where an unseen truck driver and waitress exchange repartees, to a medium shot of Tom Joad convincing the truck driver to give him a lift, to a medium close-up two shot of their conversation inside the truck cab, to a close-up of each of them in turn, ending with Tom Joad's revelation he is a murderer and ex-convict. The procedure is then repeated with Joad meeting the preacher "Reverend" Casey, who introduces the theme of loss of spirit, both in himself and in the people who have had to move off the land they have worked for generations.

In this Hollywood classic, the first six minutes introduce the central character, his inner conflict and the themes which will be developed throughout the rest of the film. The editing is seamless, always moving shots in the same direction, and the camera always anticipating the next level of interest. There are an average of approximately three cuts per minute, but the length of time varies between shots according to the amount of significant information introduced visually and the amount of time necessary to reflect on the meaning of the words, actions, and visual figures and contextual fields. Everything in this film leads us into a particular thought pattern, focusing on visual and verbal cause and effect and allowing time for absorption of emotions and ideas.

A major difference between the thoughtful adult and the restless child is attention span. Hopefully as we grow older, we begin to see the complexity of the world we live in and begin to put it all together in our minds so that it makes sense and we can discern the true causes and effects of things. The young child, however, is at a stage where meaning comes from association, and it is barraged by a continuous stream of sounds and images that it attends to only momentarily. Meaning comes through association by simple sequence of what follows what and by patterns repeated so often they become expected. Adults spend a lot of time trying to amuse babies with interesting new sights and sounds, shaking rattles, demonstrating toys that move, whir, pop, jump and whistle, calling attention to bright colors and shapes. The world of the child in this sense is one where the child is either amused or unamused, a world of attentive immersion in immediate experience, a world unburdened by the pursuit of causes and effects or the profound existential questions of adulthood.

The classical Hollywood style film which comes to its full fruition in *Grapes of Wrath* clearly speaks to the adult world. It demands sustained attention, intellectual reflection, emotional empathy. Its themes related to personal and social conflict represent microcosmic and macrocosmic tensions which can only be resolved in complexly nuanced ways, and the adult who understands the social and psychological causes and effects embedded within the film comes away with a deep appreciation of the both the dark side of the American Dream and a transcendent faith in human dignity. Filled with cultural and archetypal symbols, the film–like the novel on which it is based–speaks to profound levels of awareness in the human odyssey. For such reasons, films from their first beginnings have been very important in our lives because they provide us with personally relevant cultural stories which help us to see beyond the chaos and confusion of everyday life to find the archetypal patterns which ultimately make life meaningful.

Just as life goes by us in a torrent and it is only in moments of deliberate reflection that we can begin to comprehend its meaning, so also does film provide us with the appearance and the fluidity of life itself. But because film is an art dependent on artistic manipulation at every turn, it too requires the same kind of deliberate reflection in order to recognize the meaning of its messages and the impact they have on us. The best Hollywood films give us opportunity for both; content and editing are deliberately constructed to direct our attention and timed to give us opportunity to absorb significant mise-en-scène information, and thematic unity provides food for thought long after we have left the theater. When film is perfectly in "sync" with our thoughts, it can be a profound mass influence–as history has shown us in films like Eisenstein's *October* and *Potemkin*, Riefenstahl's *Triumph of the Will* and *Olympiad*, and, of course, Ford's *Grapes of Wrath*.

When Eisenstein's *Potemkin* premiered in Moscow, for example, crowds encircling city blocks several times lined up to see it. When the tinted red flag was run up the mast at the film's climax, people in all the theaters in which it played responded uproariously, standing on chairs, cheering, singing the "International." Lenin himself said that "the cinema is the most important of all the arts."[3] Béla Bálàzs, who taught with Eisenstein in the Moscow Film School and appreciated the power of film to manipulate emotion and thought commented:

> We must be better connoisseurs of the film it we are not to be as much at the mercy of perhaps the greatest intellectual and spiritual influence of our age as to some blind and irresistible elemental force. And unless we study its laws and possibilities very carefully, we shall not be able to control and direct this potentially greatest instrument of mass influence ever devised in the whole course of human history.... the mentality of the people, and particularly of the urban population, is to a great extent the product of this art, an art that is at the same time a vast industry. Thus the question of educating the public to a better, more critical appreciation of ... films is the question ... of the mental health of ... nations. Nevertheless, too few of us have yet realized how dangerously and irresponsibly we have failed to promote such a better understanding of film art.[4]

Bálàzs wrote this in the 1940s in what was still the hay-day of the Hollywood style. Although television was then years away from becoming the powerful perceptual influence which McLuhan later explored, today television now shares this power, with both film and television acting as reciprocal influences on each other.

More than any other single influence, in fact, television's MTV–begun in the 1980s–bears the responsibility for the change from classical Hollywood use of sequential narrative, shot framing, and more natural editing pace and seamlessness to an intensive rapid bombardment of sensual images which rush by so quickly that we do not have time to reflect upon them, but only to feel their immediate and momentary impact. While sequential narrative demands time for critical reflection, sensual images are absorbed almost instantaneously, reaching us on an emotional and attitudinal level rather than on an intellectual one.

MTV style is truly exciting: fast, colorful, and combined with Dolby sound or George Lucas's THX system, it is a riveting, sensual and primordial experience. In effect, it turns back the clock for us and we are in the same situation perceptually as the young child, responding only to what is attention-getting in the environment. In comparison, the Hollywood style movie looks boring, slow, and plodding. Instead of an easy-to-follow storyline, MTV supplies continuous sensual titillation–the stuff of raw, primordial experience distilled and speeded up until it is more like a drug rush than like real life itself.

The film most pivotal in showing this influence is the 1986 film *Top Gun*. Where *Grapes of Wrath* used seamless cuts on an average of three per minute to draw us into character as a precipitator of the action, *Top Gun* cuts sharply from one image to the next, approximately every two-and-a-half seconds. As a result, instead of being pulled into character, we stay on the surface, which–MTV-style–is glossy, sexy, and slick. Dialogue is kept to a minimum and roves over into subsequent shots creating an artificial linkage between disconnected images which pulse on and off the screen in a rock and roll beat, and images of thrust and power dominate the film. Color works on a subliminal level, as it does in Mario Puzo's *Superman* (U.S.A./G.B, 1978), where the colors which dominate the screen are red, white, blue and gold. Action is paced and structured like a videogame; the longest takes in the entire film run about four or five seconds, and these occur only when the protagonist's friend is killed and an attempt is made at some reaction shots and exchange of dialogue. Throughout the rest of the film, only brief phrases can be synchronized with the images because of the brevity of the shots, and most conversation takes the form of repartee. The ultimate effect is the reverse of the classic Hollywood style: devoid of complexity, almost non-existent in linear plot, one- or two-dimensional in character, and pleasurable without having any intellectually reflective opportunity or impetus.

Overall, the film was in its own way as impactful as *Grapes of Wrath*. In its imagery, pace and Dolby sound, *Top Gun* swept audiences worldwide up into a truly exciting and sensuous world. By association which is the basis of perceptual logic, Navy pilots who were lionized in the film began to see their own image in a more sensually exciting way–as "maverick flyboys living on the edge by day and partying by night."[5] Others also started to see Navy pilots that way too, and the Navy was highly successful in its use of clips of the film to recruit members of the MTV generation into its ranks. The film grossed over $100 million within six months of its release, and sales of the Aviator sunglasses sported by "Maverick," played by Tom Cruise in the film, went from 4 percent to 40 percent of market sales.[6]

For the Navy pilots who got caught up in the image, the nature of their annual gatherings at "Tailhook" conventions (so named for the plane hook which the pilot must lower to grab a deck wire on board aircraft carriers) began to change, until finally behavior became so extreme that a Navy scandal occurred in 1991. The Pentagon's 300–page report specifically cited the film's release as the point at which the gantlet was started–a ritual where women were accosted as they got off the elevator, physically groped and their clothes torn away. By the 1991 Tailhook convention, prostitutes were openly entertained, pornographic films were run continuously in the hospitality suites, and men walked the corridors with exposed genitals.[7] Among the immediate consequences which the scandal initiated were the resignation of one admiral and the investigation of 140 other officers in one or more incidents of sexual assault, indecent exposure and conduct unbecoming an officer. In the end, however, the Navy closed ranks around its men, and the only person who suffered substantially was the first woman Naval officer to report the outrageous conduct. Harassed and stigmatized beyond endurance, she resigned her commission the following year.

Although I do not mean to suggest a direct causal connection between MTV and specific convention behavior, I do believe that the perceptual pattern characteristic of MTV viewing substantially contributes to immersion in the moment without regard to long-term consequence, an emphasis on sexuality, a lack of cause-effect logical thinking, and the inability to emotionally empathize with others; and that this immersion in sensual experience in effect hinders the development of a mature and responsible way of perceiving and being in the world. A study done by doctors at the Whiting Institute, a resident mental health facility in Middletown, Connecticut, for example, found that prolonged periods of MTV viewing resulted in increased hallucination, belligerence, and hostility toward the staff, especially female staff, and that the elimination of MTV reduced the number of aggressive incidents against objects and other people by 37 percent.[8]

What this means, I believe, is that what is happening in film is part of a larger paradigmatic shift in perceptual process–predicted by Marshall McLuhan when he observed that "the message of the movie medium is that of transition from linear connections to configurations"[9]–and that the way we watch television and experience film is changing the way we perceive in the world and the way we think about it. In the silent film, for example, intertitle time was calculated as 3 seconds for the first word, and 1 second for every subsequent two words, with some intertitles lasting as long as half a minute. Today, as we have become more adept at reading the image the maximum acceptable time for modern subtitles of foreign films to remain on the screen as *part of* the overall image has shrunk to about 6 seconds in total.[10]

But while our ability to process the visual image and absorb its meaning emotionally and tonally has increased, there is no comparable time for reflection built into the visual presentation of television or film, nor is there any motivation in the visual format to later reflect on the immediate experience. In short, sensory stimulation alone has become the meaning–as McLuhan's now-famous dictum "The medium is the message" predicted–just as it has always been for the infant who is amused or not amused. Just as athletes train by repeating motions over and over again until the body memorizes the action, thereby making it automatic, the process of perceptual training can be just as effective.

This is particularly clear in the process of visualization. In one study by Richardson, for example, three randomly selected groups were used to test the effect of training on the accuracy of free-throws in basketball. The first group practiced only on the first and last day; the second group practiced free throws for 20 minutes each day; and the third group physically practiced only on the first and last day, and in between visualized themselves practicing free throws for 20 minutes each day. At the end of twenty days, the first group didn't improve at all, the second group improved by 24 percent, and the third group improved by 23 percent.[11] This was in the late 1960s. Since then, mental visualization has become a basic part of all effective athletic training.

When we realize that watching television constitutes visual training from the earliest childhood through adulthood, and that by the time adolescents graduate from high school they have spent approximately 18,000 hours in this visual training, we begin to see why the perceptual patterns or "mental maps" which older adults have differ so greatly from those of the MTV generation. While the experience of films like *Grapes of Wrath* can be seen as the antithesis of the child's world of limited attention and momentary sensual stimulation, the action films which have followed in the wake of *Top Gun*, such as *Under Siege* and *Under Siege II* continue the pattern of MTV pulsation stimulation without reflection, and this pattern is reinforced by video games which require total absorption in the image, fast action, and decision making without reflection. Feedback and gratification is immediate and sensory in terms of color, sound and movement.

In view of this trend, it is hardly surprising that many theorists predict that the fate of film in the near future will be inseparable from the development of Virtual Reality. Disney's *Aladdin* ride, derived from the film, for example, combines individual Virtual Reality head gear with interactive video technology to fully involve the participant in the experience by giving him or her not only the feeling of flying but also individual control over visual and physical orientation. As films become faster paced and more sensually specific, they too will ultimately come to envelop the spectator within the experience, and already some theaters have introduced moveable platforms which mimic theme park movie rides like those found in Universal Studios' "Back to the Future" ride and Disney World's "Aladdin."

Now involving millions of dollars to produce, such "film" rides bring us back full circle to the once seemingly divergent ideals of Lumière's recording of actual experience or Méliès' imagination come to life. In the process, the linear narrative and intellectual reflection which was characteristic of the Hollywood style at its best in the 1930s and 1940s has given way to raw, momentary artificial experience and titillation.

If film as art can be characterized by its ability to manipulate time and space and to direct thought and attitude in particular ways, then it is clear that film is evolving from the simple two-dimensional visual medium which fascinated viewers by the sheer novelty of its movement a century ago, to a totally immersive, multi-sensory experience which negates the probability of critical reflection and which celebrates immediate gratification over intellectual process.

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[6] Patrick Robertson, *The Guinness Book of Movie Facts & Feats*, 4th ed. (New York: Abbeville Press, 1991), 191.

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[9] Marshall McLuhan, *Understanding Media: The Extensions of Man*, (New York: McGraw Hill, 1964), 27.

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Technical Communication: A New Perspective On Visual Literacy

James S. Lenze

Purpose

The purpose of this paper is to explore another facet of visual literacy —technical visual communication (TVC)—and discuss how this new perspective can further strengthen Visual Literacy as a discipline. TVC is a recognized area of study and practice in the field of technical communication. TVC encompasses such issues as typography of text, visual aid design, visual display and presentation, multimedia, and computer generated graphics. Clearly, TVC is a field of study that stands beneath the two umbrellas of visual literacy and technical communication.

This paper will examine how TVC fits within the study of visual literacy. It will highlight those features of technical visual communication that differ from the study of visual literacy.

The Holistic View of Visual Literacy

It can be argued that Visual Literacy, as a field, is comprised of subsets from other disciplines (Moore & Dwyer, 1994). For example, visual learning theory is certainly a major focus in the study of visual literacy and, likewise, is a major focus in the study of educational psychology. It can be further argued that the strength of the study of visual literacy comes directly from its diversity.

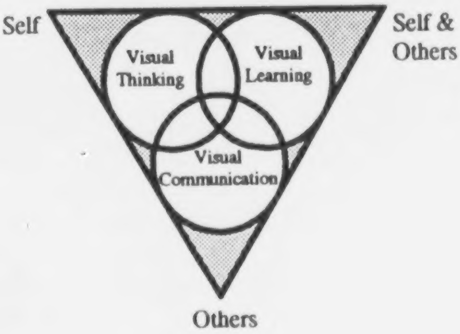
With practitioners from many fields approaching visual literacy from different perspectives the study of visual literacy becomes more holistic. Visual literacy has been approached from such diverse perspectives as learning theory (Dwyer & Moore, 1992), film (Robinson, 1985), advertising (Sayre & Mariarty, 1993), computer science (Couch, Couch, & Peterson, 1993), and even folk art (Cunningham, 1992). Although Visual Literacy is a field which is struggling to define itself, it does, in fact, have a more complete view of itself than most disciplines. The study of TVC presents the visual literacy practitioner with another facet of visual literacy.

Definitions

Visual literacy is about empowerment. Its practitioners are dedicated to empowering people to see and interpret images. A visualy literate person is able to see images and form opinions concerning the image's origins, construction, meaning, and intent. There is an inherent morality within this definition. Visual literacy protects the individual from manipulation through visual images. It does *not* instruct the individual on *how* to manipulate through visual images except for the purpose of understanding such manipulation in order to prevent it.

Seels (1994) addresses visual communication as a component of visual literacy (See figure 1). Her definition, "using visual symbols to express ideas and convey meaning." (p. 109) fits well withing the definition of visual literacy. Her focus is on empowering individuals to understand visual images.

Figure 1
Seels' Directionality of Visual Literacy Components



Although the emphasis is on the sender of the visual message, there is still a focus on empowering the receiver of the message to clearly understand the message. This approach does not account for those visual messages that are meant to manipulate or deceive the receiver. Visual literacy practitioners are not naive. Rather, they are describing a desirable state of affairs.

A different perspective is expressed in TVC. According Shelton (1993a), TVC focuses on the design of visual messages to do the same kinds of things as visual literacy's visual communication component but it goes on to "influence, propagandize, and prostitute." (p. 617). Again, the focus is on the sender and the visual message but the purposes are significantly different.

Unlike visual literacy, which looks to a desireable state of affairs, TVC addresses the nature of actual visual communication. In this regard, TVC takes a broader look at visual communication.

Again, visual literacy practitioners are not naive and TVC practitioners are not evil propaganda merchants. These two groups approach the same topic from different angles. This is the central theme of this study. Since each group takes a different approach to the study of visual communication, both groups stand to gain by examining the other's research and ideas.

A Focus On Technology

The difference between perspectives is only the beginning of the variations between the TVC and visual literacy. Although TVC practitioners would argue that the message is far more important than the medium (Shelton, 1993a) there is an overt focus on technology in TVC research.

In 1993, the Society for Technical Communication printed a special edition of the STC Technical Communication Journal devoted to Visual Communication. Nine of the ten articles specifically addressed the design and application of technology (Bowes & Elliott, 1993; Burnham, 1993; Horton, 1993; Keyes, 1993; O'Malley, 1993; Search, 1993; Shelton, 1993b; Shelton, 1993c; and Wise, 1993). This special edition also included articles which focused solely on message design (Shelton, 1993a; Williams, 1993). It should also be noted that the technology focused articles dealt with message design for specific technologies. Even visual literacy practitioners would agree that the message is greatly impacted by the medium. Still, the visual literacy research tends to put more emphasis on message design than on the use of a specific technology.

Sharing The Research

The selected readings from each year's International Visual Literacy

Association meeting provide a fairly good perspective on the types of research being conducted by visual literacy practitioners. Each set of readings includes articles on research and theory, teaching and learning, the visual arts, *and* media and technology.

Technology is a subset of the study of visual literacy. This difference between visual literacy and TVC indicates that once again these two groups stand to gain much from an exchange of information. Given the nature of technology to change rapidly, it would be wise for visual literacy practitioners to tap into another source of constantly updated information. Likewise, as TVC explores the application of old and new technologies there is an abundance of solid message design research in visual literacy texts.

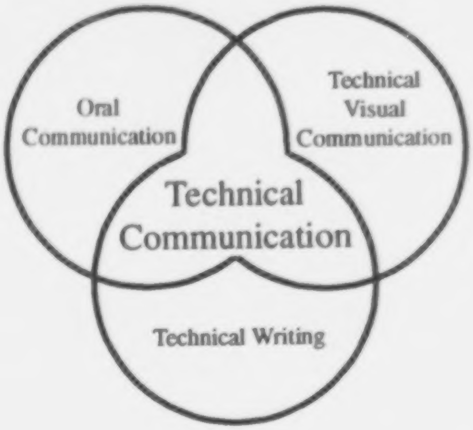
The potential for such exchanges is encouraging. For instance, Keyes (1993) article in the STC Technical Communication Journal Visual Communication Special Edition focused on typography, color, and information structure. Although She cites well known sources such as Tinker (1965) and Tufte (1990) she does not cite valuable sources such as Dwyer (1978) and Pettersson (1989). These sources are classics in visual literacy. This is not to say that Keyes work is weak; that would be far from the truth. But the addition of visual literacy texts would make for a stronger examination of the topic.

Putting Them Together

The sharing of ideas has already begun. Visual literacy is becoming a buzz term in technical communication. The technical writer's listserver frequently discusses visual literacy concerns and questions. The Society for Technical Communication has recently formed a discussion group for visual communication. Visual literacy promises to be a foundational principle for that group.

Most importantly, technical communication programs are moving to make visual literacy a fundamental part of their curriculum. Lawrence Technological University in Southfield, Michigan recently approved a bachelor of science degree in technical communication. The program has three main components (See figure 2).

Figure 2
The Three Components of Lawrence Tech's Bachelor of Science in Technical Communication Program



The first component, technical writing, is the foundation of most technical communication programs. In fact, many "technical communication programs" are really "technical writing programs." Course work in the technical writing component includes research and documentation, rhetoric, and research report.

The oral communication component includes course work in speech, collaborative communication, and interpersonal and nonverbal communication. This component is often a missing or week part of a technical communication program. Lawrence Tech has strengthened this component with faculty who special in oral communication.

The third and final component is the technical visual communication component. This component is often totally overlooked in technical communication programs. Lawrence Tech's visual program includes presentation media, document design, computer assisted instruction, multimedia design, and desktop publishing. The faculty member hired to teach these courses has experience presenting and publishing through the International Visual Literacy Association. The development of visual literacy is fundamental part of Lawrence Tech's technical communication program.

Summary

Visual literacy and tvc share some commonalities in terms of focus. Both seek to empower individuals to interpret images and form opinions concerning the image's origins, construction, meaning, and intent. But TVC goes beyond this to examine how visual communication can be used to manipulate and propagandize.

Visual literacy and TVC also differ in regard to their focus on technology. Visual literacy examines technology as a subset while technology is more central to TVC.

Visual literacy and TVC have much to gain by sharing research. Visual literacy practitioners can benefit from a continuous source of information concerning old and new technologies while TVC can benefit from a substantial visual literacy research base.

Technical communication programs are now recognizing the importance of visual communication and visual literacy. Courses within these programs are emphasizing visual communication and are working to make their technical communication student visually literate.

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The Power of the Center Revisited

Gail C. Delicio

Introduction

Rudolf Arnheim, former Harvard Professor of the Psychology of Art, searched for and truly believed that he found a key to spatial organization in the arts. His premise is that our perception of the structure of things in the world is based on two primary systems, (a) the cosmic system of *concentricity*, and (b) the parochial system of the *Cartesian grid*. Elements of the cosmic system organize themselves around a central point, and include snow crystals, hurricanes, ring-molecules, planetary motion and other wondrous things in the array of symmetrical objects and events that comprise most of the natural world. The parochial system, with everything "in a state of arrested downward motion", adjusts for the constraints of gravity, and is organized around conveniently rigid horizontal and vertical surfaces based on the Cartesian grid (1982, p. 10). The Cartesian grid imposes order in our lives, while the concentric system provides a midpoint or balancing center for everything we see. The simultaneous use of both systems is necessary to perceptually organize and visually understand every object within our view.

The Balancing Center

We take it for granted that the "center" of a regular shape like a circle, square, or triangle is always in the geometric middle of it, that it defines a structural constant, and that its location can be derived through measurement. The centers of irregular shapes, like those in free-form drawings, are not in the geometric middle, and occur in a place where compositional pushes and pulls are perceived as counterbalanced. The "balancing center" is the point at which visual forces converge to hold a composition in equilibrium.

A balancing center generally is not made explicitly visible, but rather is graphically emphasized by the artist and intuited by the observer. Although the location of this point is determined primarily by the structural characteristics of the picture, most studies that investigate it deal with the recording of eye movements over, around, and toward it (e.g., Nodine & Locher, 1988; Van Sommers, 1984; Vurpillot, 1976). In 1974, Arnheim himself recognized the methodological weaknesses inherent in modeling visual perception, and observed that "no known method of rational calculation can replace the eye's intuitive sense of balance" (p. 19). Today however, advances in computer technology have enabled researchers to analyze pictorial structure and test various models of visual perception (see Delicio, 1989).

Development And The Balancing Center

A child's first experience with drawing starts with the act of looking. In the preverbal child, it is difficult to determine whether the balancing center of a drawing can be identified as the place where he begins to scan it, or the point at which he decides to rest. Ghent (1961) hypothesized that the balancing center marks the point of departure for visual exploration, and that the location of this point changes predictably with age. She demonstrated that the very young child tends to visually explore a picture in a vertical direction, from top to bottom. Presumably, this bias toward the vertical occurs because it is coincident with the longitudinal axis of the body, and with the earth's gravitational attraction to it. It is almost as if the child's body itself serves as the frame of reference for the structure of representational space. Since visual exploration begins at the top of the picture, objects situated in the upper half of picture space are given privileged status, and are perceived as more likely candidates for the balancing center.

Further evidence supports the notion that, by age six, when a child first experiences reading, a left-right scanning strategy is adopted, and the upper left portion of the visual field is given priority in visual-motor tasks. In her research concerning visual fixations on balancing points, Vurpillot (1976) determined that children aged three to five years consistently preferred to inspect the left center of a stimulus. Older children maintained their preference for the geometric center, but viewed the left and right portions of the stimulus as equally important.

If preference for the departure point of perceptual exploration changes with age, it seems reasonable to assume that its physical placement within the child's drawing also changes. Van Sommers (1984) showed that, in sketching and dot-making tasks, a position near 11 o'clock is the preferred starting point for adults, regardless of handedness. In random line drawing, right-handed children aged three to six consciously avoided the upper left region in favor of the lower right of center, while left-handed children showed the reverse pattern. In dot-cluster tracing, right-handed children aged three to four preferred to start at lower right, but by age six, showed a tendency to start at the preferred adult position—upper left.

Method

Purpose

This paper will first provide experimental evidence in support of Arnheim's theory by demonstrating that a drawing's balancing center is indeed measurable, and that the measurement can reliable and valid when compared with human judgment. Second, it will apply the measure to test the hypothesis that the child's placement of a balancing center changes predictably with age.

Deriving a Measure of The Balancing Center

In order to measure the location of a drawing's balancing center as Arnheim described it, the picture must first be encoded within a Cartesian grid, or converted to a digitized image. According to Marr (1982) and other representationalists (Gregory, 1981; Sutherland, 1973; Zimmerman, 1987), invariant key patterns like the balancing center are embedded in pictures, and they can be decoded by analyzing the surface geometry of the picture. This principle can be easily demonstrated using a composition which has been transferred to ordinary graph paper (see Klee, 1953), or, for a more sophisticated interpretation, a bitmapped picture. In both of these examples, assuming a high contrast drawing is used, each (x,y) element in the pictorial array can be coded with either a 1 (figural space) or 0 (ground space). The processes involved in perceiving the drawing of a black shape on a white background would require the "summation" of the retina's response to the individual picture elements, taken together as a whole (Cornsweet, 1970). Hubel & Wiesel (1962) emphasize that an exact point-for-point relationship between the drawing and the receptive field map does not exist, but rather a correspondence between the picture surface and encoded information in the retina. Nevertheless, the bitmap can be viewed as a mathematically convenient way of reproducing the geometric organization of the drawing as well as a model of how the drawing is believed to be projected in early visual pathways.

Figure 1
HYPOTHESIZED BALANCING CENTER LOCATIONS

TL TC TR
CLT CRT
ML C MR
CLB CRB
BL BC BR

(a) TL, top-left
(b) TC, top-center
(c) TR, top-right
(d) ML, middle-left
(e) C, center
(f) MR, middle-right
(g) BL, bottom-left
(h) BC, bottom-center
(i) BR, bottom-right
(j) CLT, center-left-top
(k) CRT, center-right-top
(l) CLB, center-left-bottom
(j) CRB, center-right-bottom

Procedure

Computing the Balancing Centers

Six hundred fifty-two 6" X 6" high contrast ink drawings on white card stock were collected from students in grades Kindergarten through grade six. Thirty drawings labeled AA to Z (Appendix) were selected from the pool of 652 on the basis of their representativeness of hypothesized balancing center locations spanning the entire page. The 13 possible balancing center locations under consideration are found in Figure 1.

A file was generated containing computer-generated (x,y) coordinates corresponding to black pixel locations for each picture. Each picture contained one balancing center which was computed by estimating the mean of all black pixels in terms of their distances along the X-axis, and the mean of all black pixels in terms of their distances along the Y-axis. The balancing center was plotted as a function of the intersection of these means.

Deriving Human Judgments Of Balancing Center Location

The purpose of the following procedure was to establish a set of perceived balancing center locations for each of 30 drawings. Ten Kindergarten through twelfth grade art teachers volunteered to participate in this phase of the study.

Stimulus materials consisted of the set of 30 black and white high contrast original ink drawings for which computer estimates of balancing center location were already obtained. Each of the 30 drawings was backed on white paper, and covered with a sheet of clear acetate. A water soluble marker was provided for marking on the acetate.

In order to establish a frame of reference, the entire collection of 30 drawings was presented to each individual art teacher at the outset. The teachers were then asked to "locate and mark the center of balance on each single drawing". Teachers were encouraged to interpret the meaning of "center of balance" in any way they deemed appropriate, drawing upon past experience or training.

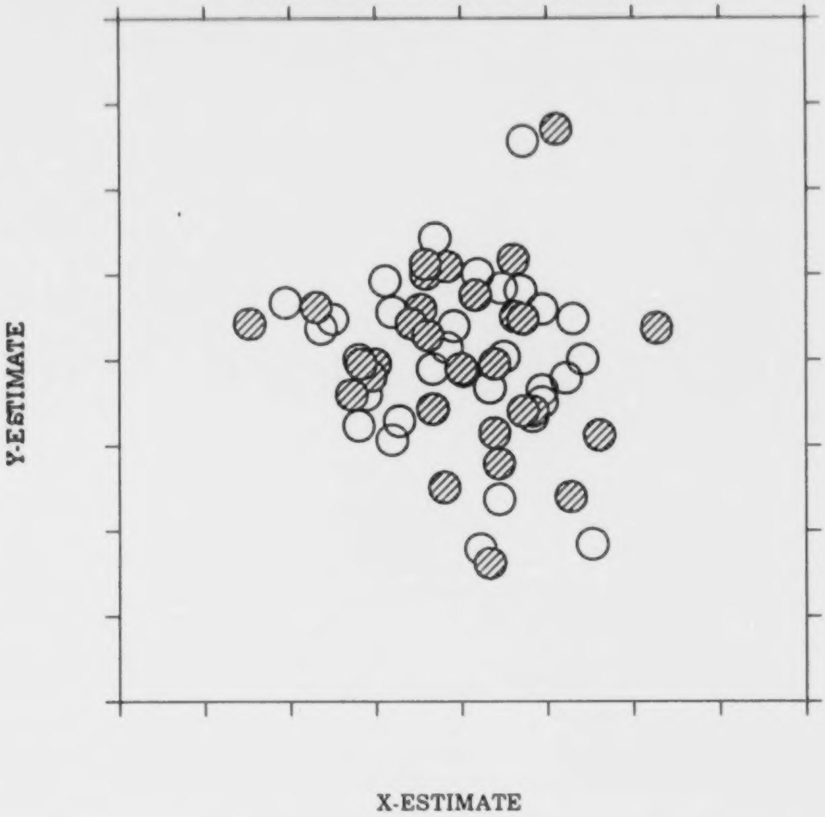
For each of the ten marks (across 30 drawings), the distance along the horizontal (x) axis and the distance on the vertical (y) axis was digitized and measured. For each of the thirty drawings, the mean of all judgments of balancing center distances along the x-axis and along the y-axis were computed. This set of means was used to represent the set of perceived balancing center locations each of the 30 drawings .

Reliability and Validity of Human Judgments

A reliability estimate of the ten teacher judgments on balancing center location was obtained by intercorrelating the (x,y) coordinate values in 30 pictures for every possible pair of the teachers. The average intraclass correlation coefficient calculated for the 10 X 10 matrix for x-axis values was 0.647. For y-axis values, the obtained intraclass correlation coefficient was 0.753. Overall, teachers were in moderately high agreement on the vertical dimension of balancing center locations, and and in moderate agreement on the horizontal.

Teacher judgment means for the 30 balancing centers were correlated with corresponding computer estimates to produce a strong agreement on the horizontal axis (r=.843), and a very strong agreement on the vertical axis (r=.912). A plot showing the computer estimates and teacher judgments of balancing center locations for the 30 drawings is found in Figure 2. The overall pattern of subjectively judged coordinates is strikingly similar to the plot of computer estimates. The Euclidian distances between teacher-judged and computer-generated balancing centers is presented in Figure 3. The greatest difference between computer and human judgment occurs for Picture EE (30 mm), while the greatest similarity occurs for Picture G (1 mm). These differences are interpretable within a 152.40 mm X 152.40 mm picture space (equivalent to 6" X 6", the original drawing size).

Figure 2
COMPUTER-ESTIMATED AND TEACHER-JUDGED BALANCING CENTER LOCATIONS FOR 140 DRAWINGS



Clear = Teacher Judgments
Shaded = Computer Estimates

Figure 3
EUCLIDIAN DISTANCES BETWEEN TEACHER-JUDGED AND COMPUTER-GENERATED ESTIMATES OF BALANCING CENTERS FOR 30 PICTURES

Picture Code	Distance (mm)	Picture Code	Distance (mm)
AA	5	H	9
A	7	J	3
BB	8	K	2
B	11	L	9
CC	12	M	11
C	15	N	5
DD	15	P	6
D	12	Q	4
EE	30	R	16
E	16	S	8
FF	14	T	20
F	18	W	8
GG	16	X	16
G	0	Y	9
HH	9	Z	15

Cluster Analysis of Balancing point Location

The purpose of this analysis was to determine whether the balancing centers in the set of 140 randomly selected drawings from children in grades Kindergarten through Six, changed predictably with age, or whether they varied randomly. Input data for this analysis were composed of the sets of computer estimates of balancing center position on the (x,y) axes for the 140 pictures. The procedure involved computing the (x,y) coordinates for six cluster centers, and classifying pictures so that members of the same cluster were similar with respect to balancing point location. Clusters are interpretable within a picture space scaled, in pixels, from -100 to +100 on both axes, with the origin at the center.

The graphic interpretation of the six cluster centers reveals that most of the balancing points in the 140 drawings tend to be situated near the geometric center of the picture space (See Figure 4). Forty-three per cent of the drawings in the largest cluster, slightly to the lower left of center, are primarily from children in Kindergarten and first grade. Clusters appear to be heterogeneous with respect to grade level, with the exception of clusters three and four (no representation by Kindergartners), cluster four (no representation by first graders), and cluster six, (no representation by fifth graders). The breakdown of the cluster membership by grade is presented in Figure 5.

Figure 4
FINAL CLUSTER CENTERS FOR 140 DRAWINGS

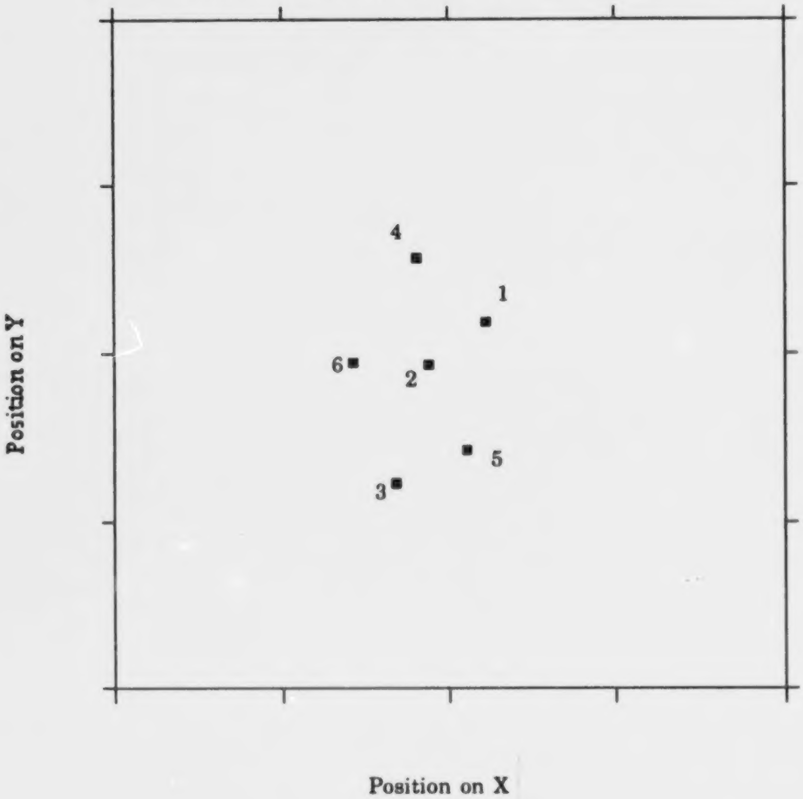


Figure 5
CLUSTER MEMBERSHIP BY GRADE

	Cluster Membership					
Grade	1	2	3	4	5	6
K	5	13	0	0	1	1
1	4	11	1	0	2	2
2	4	4	1	4	3	4
3	4	5	2	2	6	1
4	4	5	2	3	1	5
5	5	8	2	2	3	0
6	4	9	1	3	2	1

A Grade X Cluster Membership ANOVA was performed to determine whether clusters differed significantly with respect to grade level. The results indicate that grade level makes no significant contribution to explaining the variability in cluster membership (F=2.03, 6,133; p=.07).

Interpretation

The outcomes of this study can be interpreted as follows:

1. Computer generated estimates of balancing point position on the vertical and horizontal axis of picture space displayed a very strong relationship to subjective teacher judgments.

2. The majority of drawings analyzed in this study were organized around balancing centers situated near the geometric center of picture space.

3. Six (x,y) coordinate positions, all situated near the geometric center of picture space, emerged as possible classification criteria for balancing centers in the 140 drawings analyzed.

4. Using the obtained classification criteria, children's preferences for balancing center location were not explained by differences in chronological age for groups spanning Kindergarten to Sixth Grade.

Arnheim predicted that intuitive introspection alone would be sufficient for the detection of the balancing center (1982, p. 6). This hypothesis was shown to be correct in the high degree of agreement between teacher judged, and computer-generated, balancing centers for 30 drawings.

A cluster analysis was performed on computer estimates for 140 drawings to determine whether a developmental trend occurred in the selection of balancing center locations. Six cluster centers emerged, representing the mean of means (of positions on the x- and y-axis) of all cases associated with the coordinate address of the cluster. The locations preferred by children in Kindergarten and first grade were slightly to the lower left of center, and slightly to the upper left of center, respectively. Under the assumption that the balancing center represents the starting point of visual-motor exploration on the page, these results concur somewhat with those of Vurpillot (1972). They are in contradiction to Ghent's experimental results on children's scanning behavior, and to Van Sommer's work with drawing production tasks.

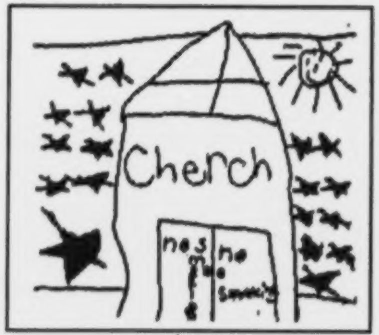
As predicted by Vurpillot, children in all age groups of the present study displayed a preference for balancing centers near the geometric center of the drawing. The position to the lower left of center was dominated by drawings made by the youngest artists (aged six to seven). In Vurpillot's experiment, which used line drawings of houses as stimuli, exactly the same location was cited by three-, four- and five-year-olds as the preferred fixation point in visual scanning.

Van Sommers found that in sketching and dot-making tasks, the lower right was the preferred starting position for drawings produced by right handed children aged three to six. In the present study, however, only thirteen per cent of the pictures displayed balancing centers in the cluster to the lower right of center. Pictures from all age groups were represented in this cluster, with the greatest number (6) from third grade, and the least (1) from Kindergarten and from fourth grade. Only ten percent of the pictures showed balancing centers in a position to the upper left of center. Pictures from all grades, with the exception of Kindergarten and first grade, were represented in this cluster.

These results contradict Ghent's prediction that, due to the influence of visual reading behaviors, the primary location of choice for children six and older would be the upper left region. It is interesting, however, that pictures from the youngest artists are not represented in this group.

The data obtained in this study suggests that children in Kindergarten through the sixth grade show a strong bias for balancing pictures around a balancing center situated close to the geometric center of picture space. The area of picture space that captured balancing centers in all drawings was bordered, on average, by about three centimeters of blank space, in all directions. Preferences for balancing center location were not explained by differences in chronological age. Counter to the expectations of Ghent and Van Sommers, neither the upper half of the picture nor the 11:00 position emerged as privileged areas in the composition of drawings in this analysis.

Appendix
Thirty Drawings Used In Balancing Center Analyses



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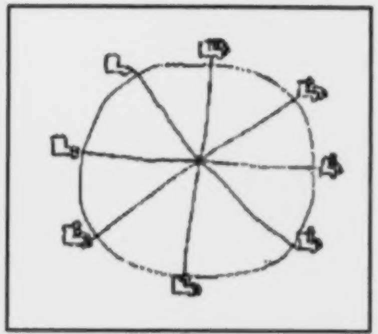

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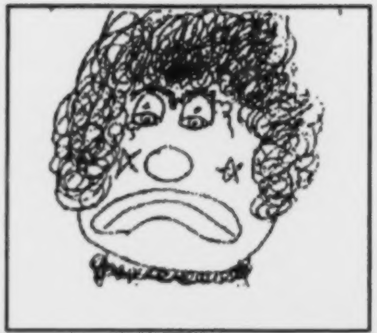

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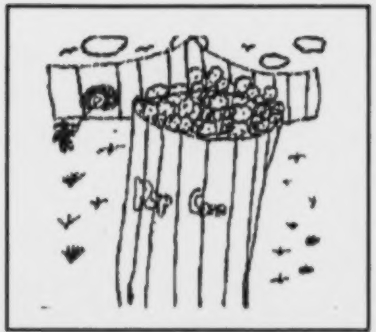

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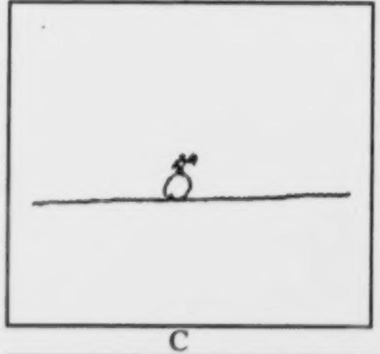

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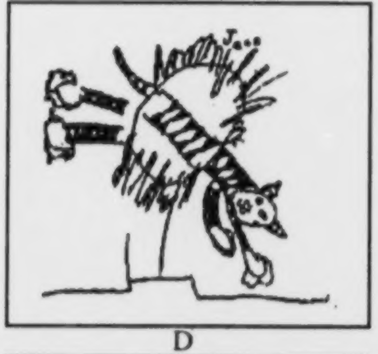

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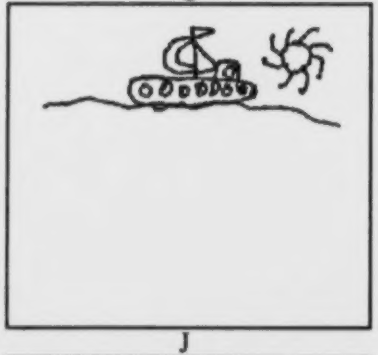

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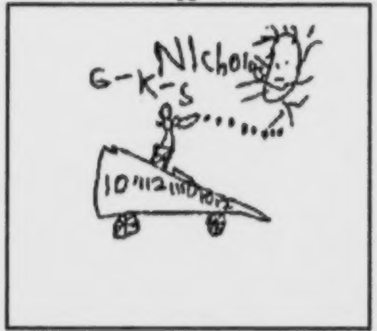
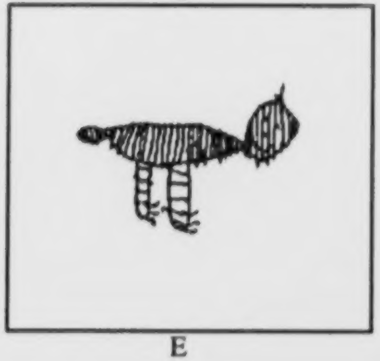

Nicholas
G-K-S

K



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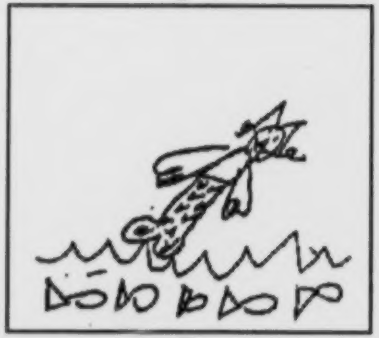

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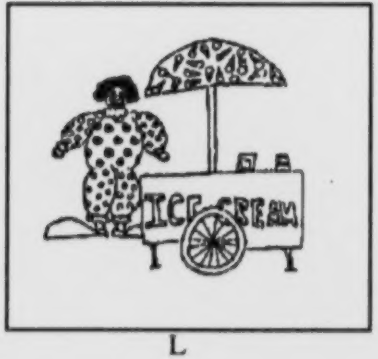

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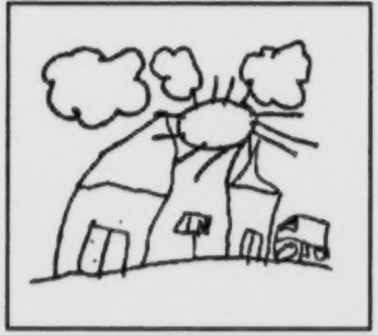

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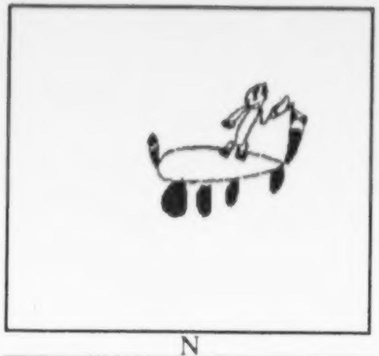

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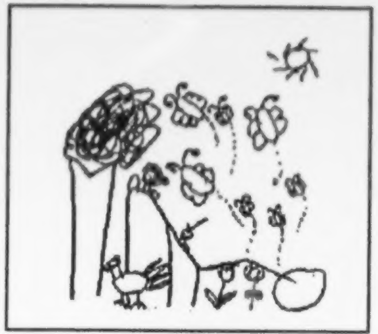

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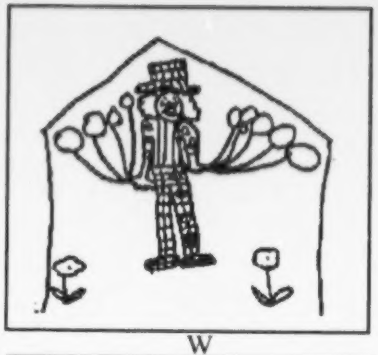

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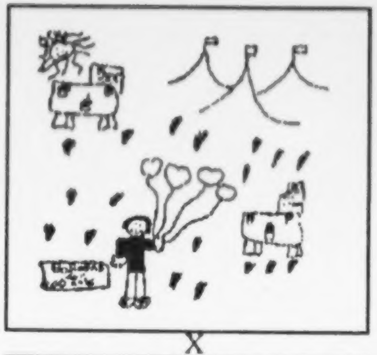

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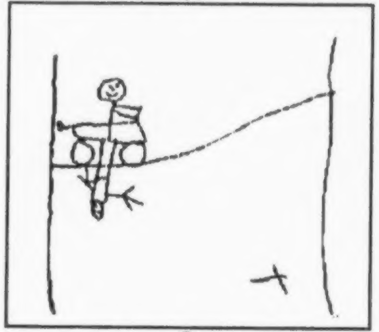

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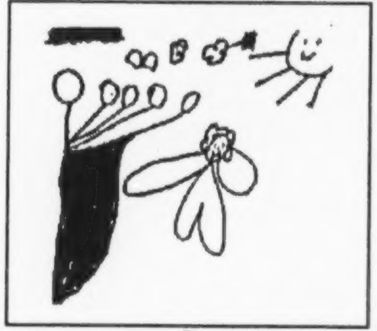

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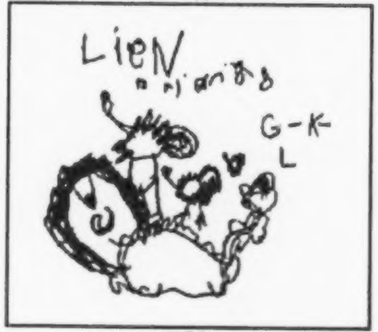

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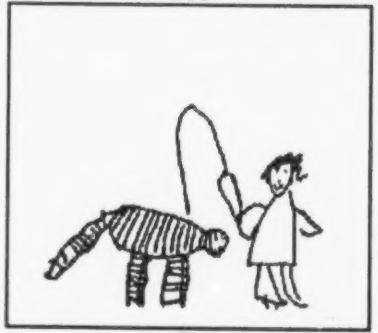

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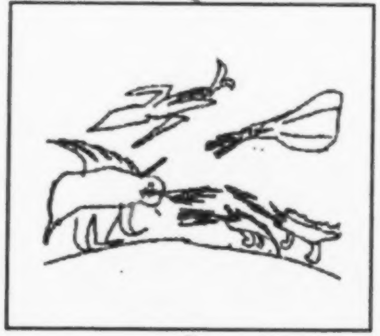

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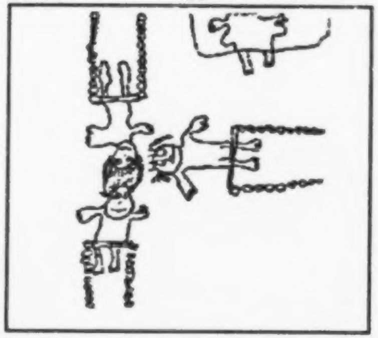

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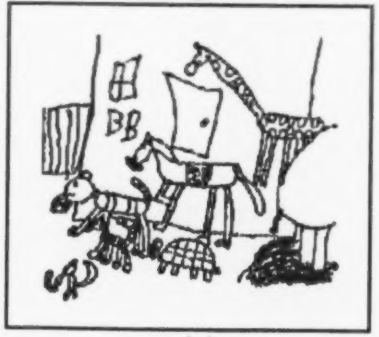

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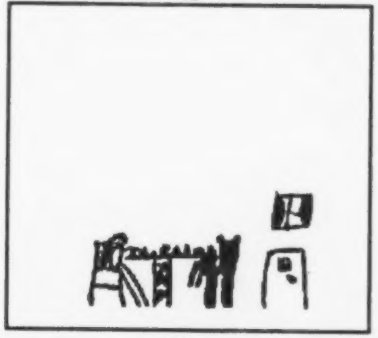

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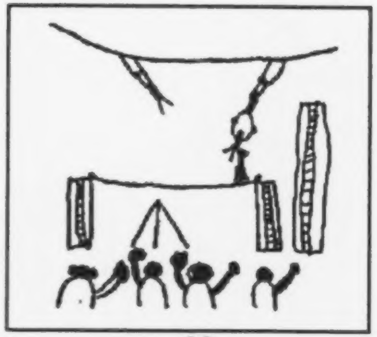

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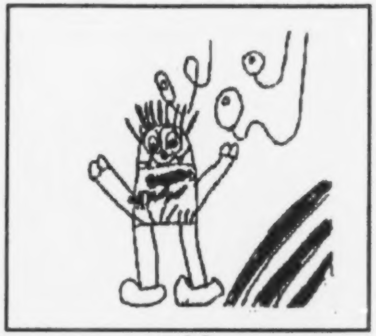

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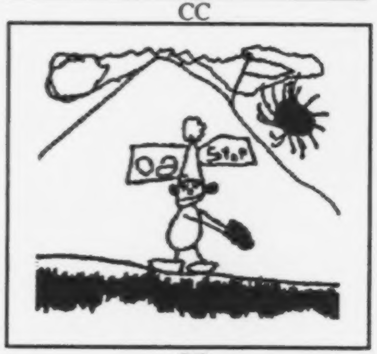

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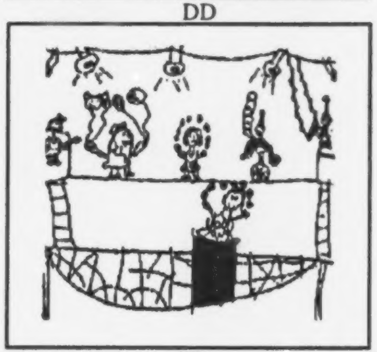

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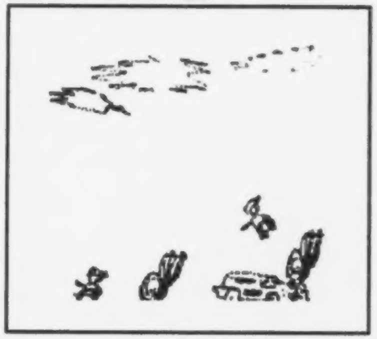

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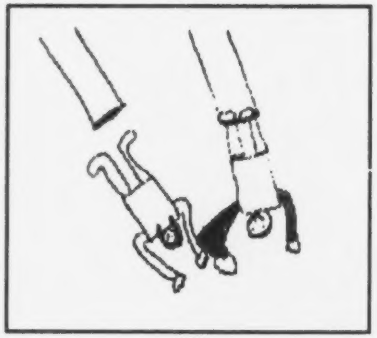

HH

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Planning For And Implementing Internet Training For Teachers

by Steven M. Baule and Suzanne M. Lyons

Introduction

Training teachers to be confident and proficient users of Internet resources is a difficult task facing many school districts. Because the nature of the Internet is one of constant evolution, defining the task of training in a systemic manner becomes difficult. In order to create a successful Internet training program, many factors must be taken into consideration.

It must be stipulated at the outset that no one person has enough extra time to provide all Internet training. In addition, it should be noted that no one person has enough skill to provide all training. Upon establishing these two factors, it is vital to have support for the program at the highest administrative level. Trainers should have release time in order to accomplish the tasks involved with training and, ideally, there should be staff members whose sole responsibility is the design and implementation of the training program. District level support should be based on the ongoing need for provision of Internet service to teachers. Teachers should have access to a building level support structure to assist them in utilizing network resources, even after they have participated in training activities. Without the network support infrastructure in place, the frustration level of users will rise and effective use of network and Internet resources will be marginal. Upon resolving the issue of district support of network access and training, a network mission statement should be formulated. Derived from this mission statement should be an implementation action plan to be updated annually.

Setting Goals and Objectives

The first issue that must be addressed when developing Internet training is defining goals and objectives for the training. Identifying these goals should begin by assessing the needs of the network users. Administrators and teachers should be asked what they would like to get from the Internet and how they will use it with students in the classroom. If they do not have the basic knowledge of what is available on the Internet, it is necessary to familiarize those individuals with the possibilities and assist them in identifying resources for curricular integration.

Next, the various methods of Internet access must be defined. Two of the basic methods of access are dial-up connections and direct connection to an Internet host. Within each of these connectivity options are a variety of tools available to users. A number of interfaces are available to access these tools including text based systems, menu driven systems and graphical interfaces. Consider the advantages and disadvantages of all the access options. For example, command line or menu driven interfaces are less intuitive and more difficult to master. Therefore, more training and a higher level of user support is needed for these systems.

Training priorities must be set based on visualizing the school as a learning organization. Creating this learning organization involves not only the development of skills at the individual level but also the encouragement of independent learning as a lifelong process. It is, therefore, crucial to see that the development of human capital plays a role not only at the individual level but is also important to the growth and well being of the whole organization. A training program that is well-defined serves a dual role of fulfilling individual learning needs as well as enabling learning at the organizational level. This allows the organization to successfully adapt to an ever changing environment.

Identifying who should be trained and defining the spectrum of proficiency to which they should be trained is the next step. To some users, having an awareness of Internet resources is sufficient while other users may need to become very proficient in the use of the Internet. Differentiate the various needs of these users and set training priorities that correspond to them.

Training the Trainers

Upon identifying the goals and objectives of training, based on the physical access to the Internet and the needs of the users, personnel must be designated to actually do the training. These individuals must be motivated and, because of the perishable nature of the skills, they must have ongoing time and opportunities allotted to them to update their knowledge. Ideally, teachers themselves should be used as Internet trainers because they have classroom experience and can share ideas for curriculum integration. Students can also be valuable resources in management of training and network support. Providing students the opportunity to be contributing members of their educational community positively reinforces appropriate network use. Students often have more time, patience, and persistence when troubleshooting or searching for answers. Students and teachers together can form learning partnerships that can be beneficial to both parties (Black, 1995). When utilizing students as network support resources, make sure they have an adult contact to whom they can address questions and concerns about network use.

Trainers should be strongly encouraged and permitted to make use of the wide array of resources available to them. Print resources such as books and journals can be valuable as well as attending workshops, conferences, and local users' groups. Of particular interest to trainers is the variety of online resources. One such resource is the interactive workshop entitled "Navigating the Internet" (gopher://gopher.esu.edu:70/00/Help/net_stuff/training) by Richard Smith at the University of Southwestern Louisiana. This self paced course covers a wide variety of

Internet tools and can serve as a model for trainers to develop in house training.

Another method for trainers to keep abreast of issues is to subscribe to listservs devoted to the issues of Internet training such as the NETTRAIN listserv (LISTSERV@UBVM.CC.BUFFALO.EDU). David Passmore, a professor of education at Pennsylvania State University and founder of a TRDEV-L (LISTSERV@PSUVM.PSU.EDU), a training and development listserv notes some factors influencing people's use of a listserv. Listservs provide an enhanced sense of community by allowing people with similar interests and functions to interact. They can allow users to get information from other users on everything from products and services to discussions of the ethical issues of network use. Making use of the Internet as the medium for communication serves the function of providing an immediate response to requests for this information. Finally, listservs allow for a level playing field. There are no preconceived notions of an individual's position or job title, thus allowing for interaction at a much deeper level (Sorohan, 1994).

Trainers must also act as an advocate for teachers' use of the Internet. Trainers must realize that teachers have high expectations for using the Internet. Facilitating this use involves guiding teachers into visualizing the Internet as one of many resource tools available for teaching.

The Training Sessions

After trainers have been established and are sufficiently prepared to conduct training, the training sessions themselves must be developed. As a rule, training sessions should be ongoing and constant. The three basic methods of organizing content are:

- show the entire spectrum of network tools.

- focus on a single network tool (e.g., Netscape).

- focus on a set of subject related resources valuable to the participants.

When training on a range of Internet tools, the training program should take the form of a half day to three day workshops. In this workshop model, there is intense exposure to the tool and should include a "hands on" opportunity to give participants experience in using the Internet. The disadvantage to such training is that the participants often feel overwhelmed at the magnitude of information they are receiving. An alternate approach to training is the use of a progressive model. Taking place over several weeks, participants are given the opportunity to practice skills between meetings and focus on areas of specific interest to them. A disadvantage here is that a good overview of the Internet may not be presented and participants must draw the parts of the Internet into a cohesive whole on their own (Black, 1995).

When scheduling short training sessions, they should be held multiple times throughout the day to accommodate as many schedules as possible. The student to instructor ratio should be 12 to 1 or less, especially if hands on opportunities are available. Ideally these sessions should range between one and one half hour in length. Not all sessions need to allow for hands on opportunities. Utilizing demonstrations or introductory presentations can be powerful motivators and can be used in settings such as teacher inservices and faculty meetings. In addition to scheduling school year training, examine the possibility of summer sessions when the teachers' time is less hectic.

Prior to the session, the trainer should know the background of the audience and tailor objectives to match the composition of the class. These objectives should be clearly outlined and presented to participants at the onset and participants should have the opportunity to match their expectations to those of the trainer (Makulowich, 1994).

Trainers should be prepared for the various learning styles of participants and they should also have some knowledge of adult learning theory. One of the basic concepts of adult learning is that adults are responsible for their own learning experiences. Once they see the need for learning they will participate in it. Trainers should use a constructivist approach to training and build on what people already know from life experience. As in any teaching situation, the focus should be on the learner (Hert, 1994).

During the session itself, there should be a minimal amount of lecture, allowing for maximum hands on opportunities. An overview of the Internet should be offered and, even in introductory sessions, the trainer should show the complexity of the Internet to some extent in order to display the richness of the tool. Users often find the Internet overwhelming and disorganized. Presenting an overview of what is available and how the connections are made can give participants a more global perspective of the way the Internet works. When teaching the technical skills involved in using Internet tools, the trainer should intersperse a variety of practical tips and techniques, including personal anecdotes of successes and failures. This can help participants focus on the actual utilization of the tool rather than strictly on the mechanics of how it operates. The participants can also be encouraged to work in pairs or small teams. This provides a less intimidating atmosphere for reluctant users and also allows for cooperative learning.

Flexibility during training sessions is a requirement for providing quality instructions. Trainers should be prepared for technical glitches by having prior sessions saved on transparencies. A scripted session can sometimes be limiting when faced with failed network connections. Sometimes, a "live approach" is a more useful method, even if problems occur because participants can learn as much from mistakes as from successes (Page, 1994).

Trainers should provide participants with support materials that they can take away with them at the conclusion of the training. These materials should provide methodical instructions and should support the training that takes place during the sessions. This way, participants can have something to look back on to remind them of key concepts. The documentation can also contain troubleshooting tips and some more advanced concepts for those who wish to expand their knowledge base. In addition to materials produced in house, the trainer can also present recent journal articles and books that would be of interest. Of course, all materials should be accurate and as timely as possible. Because the Internet is always changing, it is essential that materials be reviewed and updated in a timely manner in order to be useful as learning tools.

Participants should always leave a training session with the name of someone to contact for further help or to assist in problem solving. Again, the idea of ongoing and continual support is vital to the success of the training program. Users will not reach their full potential if they are not productive in their use of the Internet. After the training sessions have been completed, the instructor should have further contact with participants to make sure that the training has met the need.

Evaluation

The success of a training program lies in the value placed on the evaluation of the program, both by participants and instructors. Seeking honest, forthright information regarding the training is important and utilizing this information to improve the training is necessary. Working with the knowledge that the Internet is constantly evolving, those involved in the planning process for training must also be committed to the need for updating and fine tuning instructional goals of training. Assessment should take into account not only whether goals and objectives were met but also measure the success of the process itself. Questions should be raised about the transfer and application of learning to the participant's job within the school. Did the learning have an effect on the functioning of the organization, based on the participant's experiences?

Evaluation should take place at the end of the session on an individual basis in order to ascertain how each individual responded to the learning environment. Evaluations can then be examined as a group to assess the success of the process of training. Participants should be contacted with follow up questions after a period of time. This period of reflection can determine if the learning was long term or if the training program needs to focus on skills that seemed to fade over time.

In addition to being satisfied on a personal level, all individuals who took part in training, whether trainer, participant, or technical support should be recognized by the school's administration. Recognition substantiates the training program and gives it validity among all school employees. Providing a well developed, well thought out training program will ensure the productive use of the Internet and its integration into the educational program.

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Arrows: A Special Case Of Graphic Communication

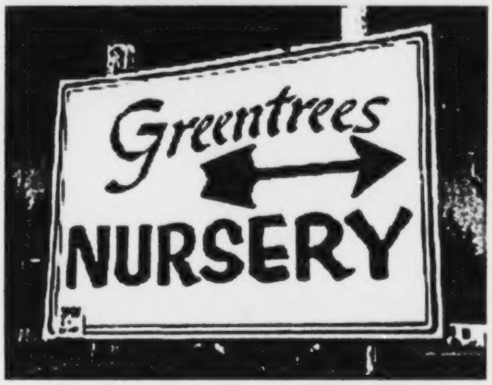
by Pris Hardin

Graphic arrows dart through our lives, labeling, directing, describing paths and processes. They serve many roles from linking labels to machine parts in technical drawings, to connecting elements of flow charts to directing traffic in defense of life and limb.

Like numerous elements in our lexicon of graphic icons, our unquestioning acceptance of the meanings of arrows deserves investigation. What makes an effective arrow? Are there "good" and "bad" arrows? Is the preference for one arrow design over another a matter of personal whim or a part of a larger graphic language that we learn to interpret? These questions prompt a call for investigation of arrow design in relation to the type of pointing, connecting or processing involved.

Figure 1

CONTRARY FEATHER ON NURSERY ARROW

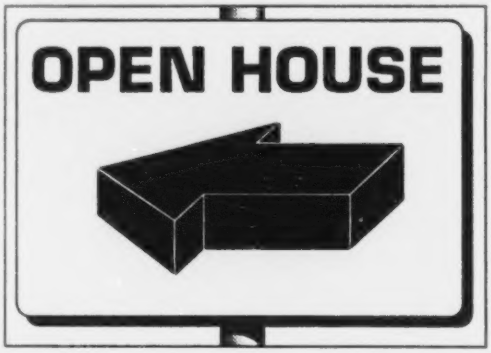


In Search of Meaning

Several observations lead one to suspect that arrows represent a special case of symbolic meaning. Examples of arrows that seem awkward, confusing or "wrong" are easy to find. Figure 1 shows a roadside sign displaying an arrow that could be construed as pointing in two directions at once—especially by a motorist passing at highway speed. Figure 2 depicts a mass-produced arrow intended by a nationwide real estate company to direct buyers to a nearby open house. From a distance, drivers may see a random polygon rather than a clearly defined arrow shape. In this instance, the arrow looks like one offered to users in a popular computer software application. That we can identify arrows that seem to

Figure 2

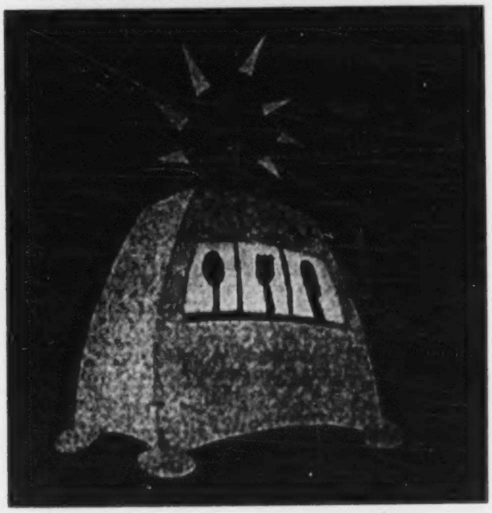
RANDOM POLYGON ARROW



violate some intuitively-held rule suggests that rules for arrows do exist.

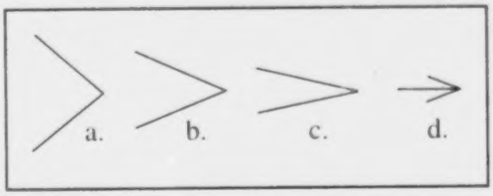
Another observation suggests that we hold in our minds some rules for defining arrows—we seem to quickly and skillfully differentiate between forms intended as arrows and forms similar to arrows. The triangular shapes surrounding the head of the cartoon figure in Figure 3 are identical in form to arrows used in numerous drawings. Yet we readily identify them as carrying a different, non-pointing meaning. We also interpret certain equilateral triangles as arrows, like the forward and rewind controls of recording machines, while we easily identify other equilateral triangles as site markers on maps or traffic warning signs.

Figure 3
ARROW HEAD SHAPES
WITH NON-ARROW MEANING



A third observation suggests that arrow meanings may vary with variations in arrow shape. Adrian Frutiger (1989) states, with a ring of authority, that the arrow heads in Figure 4 connote greater force or movement as the angle of the arrow head becomes more acute (toward the right side of the figure).

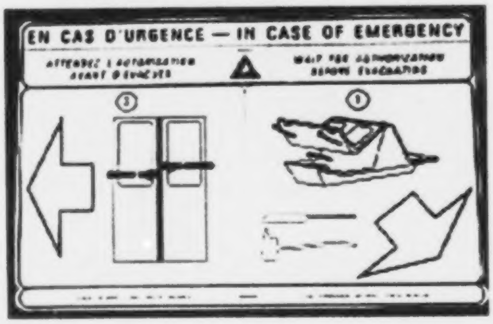
Figure 4
ANGLE OF ARROW HEADS
From Frutiger, 1989



> The expression of the angle sign as a direction pointer alters considerably with the degree of the angle. One that is greater than 45° is seen rather as a resistance against an oncoming force, such as a dam (a). A 45° angle sign is recognized as a moving sign, but only with slow and difficult movement, like a snow plough (b). At about 30° the angle sign can be compared to an earth plough (c). Only from about 20° downward does the angle sign become an arrow (d). The inner area is small and less visible; the sharp point produces a reaction of danger, against which viewers must protect themselves. The angle sign has become a weapon.
>
> Frutiger, p 48
> *Signs and Symbols*

No reference to investigative authority accompanies Frutiger's assertions. Are these assertions true for most viewers of arrows? Under what conditions are these assertions true? Perhaps Frutiger's certainty is true with his native German culture. Are there exceptions? Figure 5, a sign posted inside the cars of the metro system in Montreal, Canada,

Figure 5
METRO EMERGENCY ESCAPE
ARROWS—Montreal, Canada



shows two arrows of the type Frutiger claims represent "resistance." In Montreal, this arrow shows riders the path of *least* resistance to an emergency exit.

The confidence with which Frutiger presents his ideas serves to make the point that some authority other than personal opinion would be helpful to guide arrow users who intend to make the most effective communication. Probably the most valuable interpretation of Frutiger's statement is that there is a need for research.

Before proceeding to outline factors that researchers should consider in designing any investigative process, a basic set of terms would be useful to facilitate discussion of arrows. Figure 6 suggests a graphic lexicon.

Approaches to Investigation

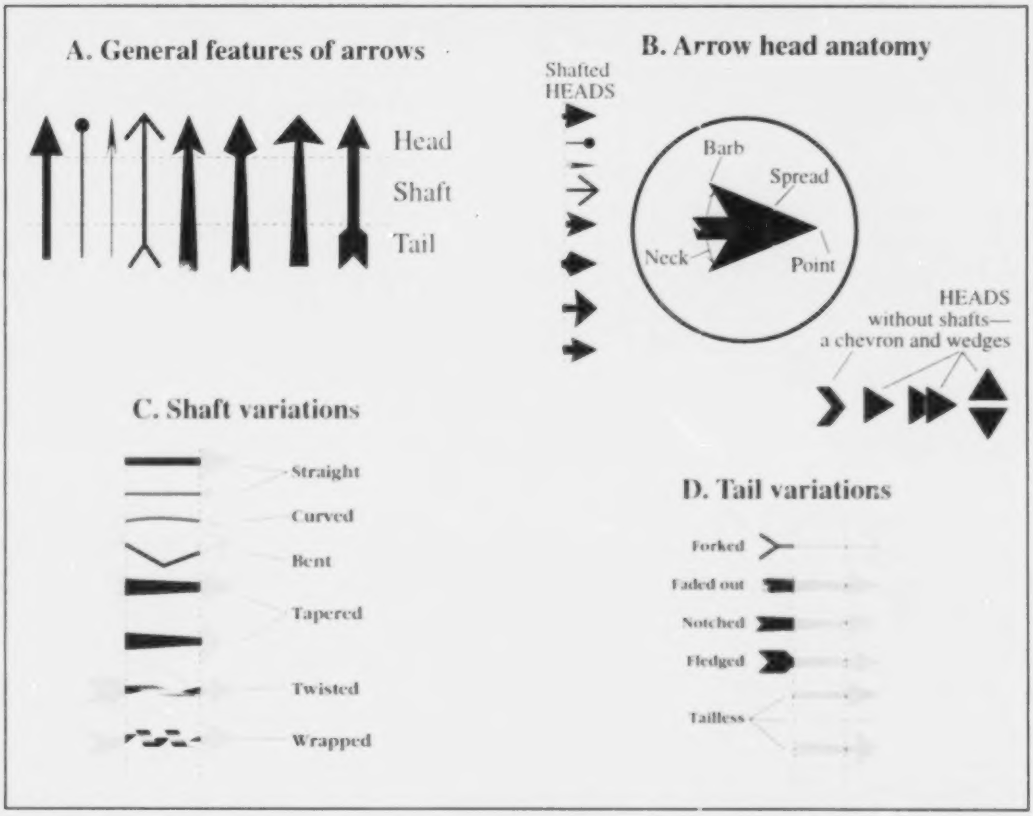
Three possible approaches to investigations of arrows as graphic communication follow:

- research by arrow function
- research relating message structure to arrow design
- research linking user expectations to arrow design.

Arrow Function

Studies of arrow function might reveal relationships between arrow design and arrow function. Four functions emerge following a subjective survey of existing arrows: IDENTIFY (one-point functions), CONNECT or LINK (two-point functions), DIRECT (imperatives directing action and describing processes).

Figure 6
PROPOSED NOMENCLATURE FOR ARROWS RESEARCH


A. General features of arrows
Head
Shaft
Tail
B. Arrow head anatomy
Shafted HEADS
Barb
Spread
Neck
Point
HEADS without shafts— a chevron and wedges
C. Shaft variations
Straight
Curved
Bent
Tapered
Twisted
Wrapped
D. Tail variations
Forked
Faded out
Notched
Fledged
Tailless

Identifiers

These one-point-function arrows serve as pointers to precise locations on charts and graphs, diagrams, and drawings. From you-are-here pointers on orientation maps to arrows labeling items in mechanical drawings, identifiers perform the most simple functions of all arrows.

Connectors

These two-point-arrows link elements together. They may be two headed as some arrows in sociograms, flow charts and mind maps.

Directors

These arrows are the imperatives of arrow communication. They map action—directed at the viewer or describing a flow of elements and processes like the way-finding arrows directing participants through a maze or the great, spiraling arrows that teach the turbulent climb of hot air in a tornado. Director arrows represent action in a static graphic format.

Message Structure

Content, context and style are message-related variables that arrow design should serve to interpret. Variations in one or all of the arrow components represented in Figure 6 may serve to convey meanings related to content and context.

Arrow content or basic directional message are presumably reflected in the arrow form and orientation. However, there are cases where arrow design becomes virtual obfuscation to the reader. Some technical drawings utilize arrow heads of such tiny and narrow design that only trained workers find their way easily through the content of the blueprint. By the same token, the arrow in Figure 1 may actually be interpreted as pointing in the opposite direction from the nursery owner's business.

Arrow context also influences arrow design. If placed within a drawing or photo of densely packed images and colors, some arrows of relatively simple and clear design may become lost in the busy environment. Designers of arrows that must communicate in busy environments should develop a lexicon of graphic devices for assuring good visibility. Research of arrows and message structure must control for variations in arrow context.

No consideration of arrow design would be complete without giving attention to the descriptive potential of arrow style to interpret content and context. In addition to the function of pointing, arrow design may describe degrees of urgency, authority, speed, power and a rich range of other amplifications of the basic direction indicated. These characteristics are the "adverbs and adjectives" of arrow design. These variables must be accounted for in any study of arrow design and message structure.

The arrow in Figure 7 represents an example of possible stylistic misuse of the dotted line shaft. Intended to firmly and clearly direct buyers to the family fruit stand, the dotted line seems less forceful than the situation warrants. The style of rendering—informal, dry-brush—also contributes to a less precise message.

Figure 7
HOME-MADE SIGN FOR FRUITSTAND

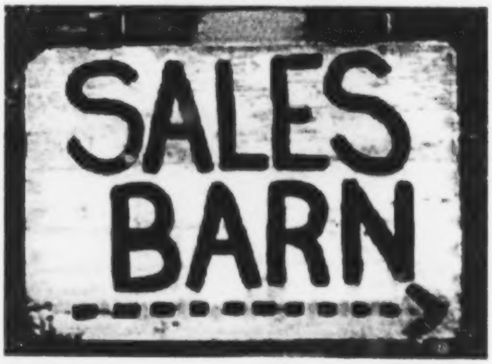
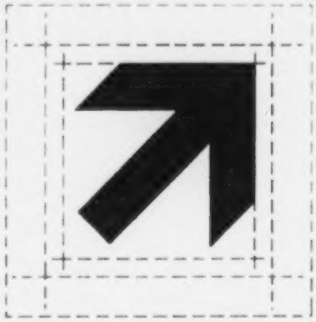
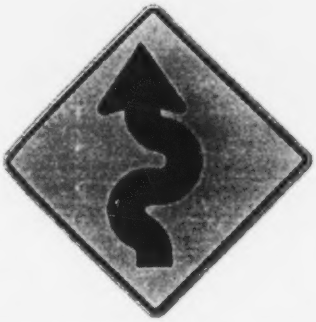


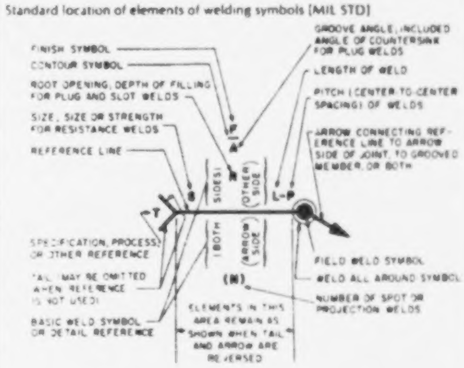
Figure 8
EXAMPLES OF TECHNICAL ARROWS



AIGA 1979



Pennsylvania Dept. of Highways 1955



Standard location of elements of welding symbols [MIL STD]
FINISH SYMBOL
CONTOUR SYMBOL
ROOT OPENING, DEPTH OF FILLING FOR PLUG AND SLOT WELDS
SIZE, SIZE OR STRENGTH FOR RESISTANCE WELDS
REFERENCE LINE
SPECIFICATION, PROCESS, OR OTHER REFERENCE
TAIL (MAY BE OMITTED WHEN REFERENCE IS NOT USED)
BASIC WELD SYMBOL OR DETAIL REFERENCE
GROOVE ANGLE, INCLUDED ANGLE OF COUNTERSINK FOR PLUG WELDS
LENGTH OF WELD
PITCH (CENTER-TO-CENTER SPACING) OF WELDS
ARROW CONNECTING REFERENCE LINE TO ARROW SIDE OF JOINT, TO GROOVED MEMBER, OR BOTH
FIELD WELD SYMBOL
WELD ALL AROUND SYMBOL
NUMBER OF SPOT OR PROJECTION WELDS
ELEMENTS IN THIS AREA REMAIN AS SHOWN WHEN TAIL AND ARROW ARE REVERSED
F
A
R
S
T
L-P
(N)
(BOTH SIDES)
(OTHER SIDE)
(ARROW SIDE)

Polon 1967

Roles of arrows

A third variable with bearing on investigations of arrow design has to do with the viewer's expectations of arrow form and function. Research design must consider reader expectations of arrow types whether they follow paradigms as technically defined as engineering or architecture arrows or as popularly defined as those in comic strips and cartoons.

The writings of Edward Hall offer a framework for categorizing culturally held norms. Hall develops a continuum of three categories: technical, formal and informal. This continuum assumes ranges of rules from the analytically codified, written ones (technical) through unwritten but verbally describable rules (formal) to rules so intuitively held that few can articulate the rules and violations prompt involuntary reactions of dismay, laughter or anger (informal). With a bit of license, these criteria may apply to the business of accounting for viewer expectations of arrow design.

All three categories of arrow rules appear to exist. *Technical rules* governing arrow usage appear in fields such as mechanical engineering, traffic management and international signage. In these arenas, published documents specify the dimensions and style of rendering for each category of arrow usage (American Institute of Graphic Arts 1979, Dreyfus 1972, Pennsylvania Dept. of Highways 1955, Polon 1967). Figure 8 offers some examples.

Formal rules obtain in disciplines where arrows serve in flow charts and mind mapping activities. The American Institute of Graphic Arts (AIGA) (1974, 1979) documents many icons that fall into this category. The AIGA publications present numerous examples of each graphic icon followed by general commendation of several outstanding images

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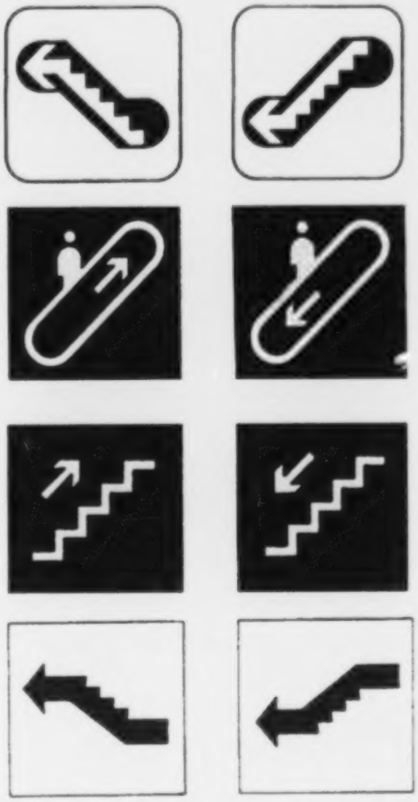
(Figure 9). Designers are urged to employ *similar* graphic devices; no technical requirements appear to be in place.

Figure 9
EXAMPLES OF FORMAL ARROWS



AIGA 1974, 1979

Informal rules, if they can be shown to exist (Hardin 1982), obtain in general signage situations, cartooning and other areas where arrows serve (see Figures 1, 2 and 3). Carl G. Liungman's *Dictionary of Symbols* represents an ambitious effort to identify ancient and historic icons, including arrows, and seek out their derivations.

An Intitial Proposal

Since a brief search of the literature failed to produce model research procedures for investigating arrow efficacy, I submit one possible preliminary strategy for consideration.

By presenting verbal descriptions of situations that call for arrows, respondents could select their preferred style of arrow appropriate to the need from sample clusters of arrows. Early casual exploration of this strategy might involve very brief descriptions of the arrow needs and settings as presented in Figure 10.

If preliminary evidence warrants further inquiry, more carefully structured investigations should be designed. At that point, descriptions of arrow-dependent situations should be designed to incorporate variables covering all of the factors laid out in this paper: arrow function, message structure and reader expectations or roles.

Conclusion

Full benefit would derive from a variety of research strategies and designs that pursue reader expectations across cultures as well within disciplinary paradigms. Studies that *elicit* arrows from participants would target most directly the question of informal norms. Computer-based data gathering might circumvent the problem of codifying clumsily drawn handmade arrows.

A research-based body of knowledge could emerge that would inform arrow selection by designers, technicians, computer programmers and, ultimately, by general publics.

Figure 10
PROPOSED SURVEY INSTRUMENT FOR INITIAL INQUIRY

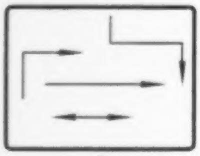
Arrow Clarity Survey

Return completed form to Pris Hardin

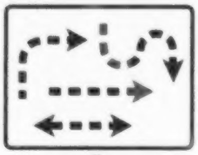
This survey calls for matching each written description below with one of the boxes of arrows.

For each of the situations described in text, choose the type of arrows that you believe would most clearly communicate the movement or direction of labeling required. You may use any category of arrows as many times as you want. You are not required to use all of the categories shown to complete the survey.

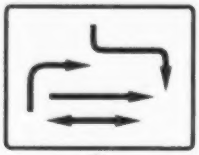
Note: Don't expect to find a specific arrow in a box that exactly describes the connection you have in mind; rather each box of arrows is meant to represent a style of arrow that you would follow in crafting the contour, size and length of the arrow or arrows you would need to do the job.



1.



2.



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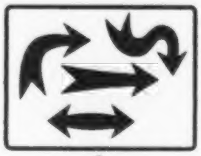

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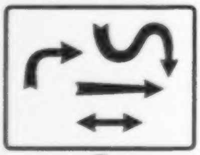

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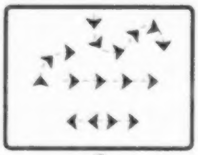
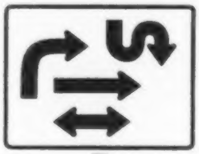


6.



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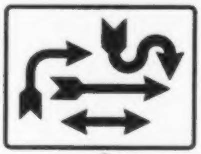

8.

Write # of selected arrows box below.

____ Choose a category of arrow for a sign in a hallway directing parents to the school office around the corner.

____ Choose an arrow type to show on a drawing where the trackers worked their way through the underbrush and around the fallen tree to get back to the trail.

____ Which arrow type would you use in a drawing to describe the back and forth action of a new shredder appliance.

____ Choose a category of arrow for use in a mechanical drawing to connect a widget with its proper location in the engine layout.

____ Which arrow category would you pick for a drawing that shows the path followed by a steel ball as it rolls down a winding chute?

____ Choose an arrow type for a sign guiding drivers off of a freeway and under a bridge to a park.

Write # of selected arrows box below.

____ Choose a type of arrow to use in an ad describing the upper body action promoted by a rowing machine.

____ What type of arrow style would you choose to mark the path of a local fun run on the city map?

____ Choose a category of arrow for use on a blueprint showing plans for constructing a backyard doghouse.

____ Which arrow category would you use on the "road signs" for a preschool's tricycle safe driving course?

____ Choose an arrow category with which to describe the squeezing action of a team of cowboys as they herd cows toward a corral gate.

____ Which arrow category would you use on a map to show how wind currents on a lake move floating surface debris away from the dam.

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Using Art Criticism To Examine Meaning In Today's Visual Imagery

Mary Ruth Smith

Introduction

The **objective** of this paper is to show how a method of pedagogical art criticism can be used to examine the meaning in one of today's most pervasive forms of visual imagery: the advertising image.

The simplest **definition of art criticism**, as suggested by Feldman (1973), states that art criticism is "more or less informed organized, talk about art" (p. 50). As informed discourse about art, art criticism can be considered as an educational procedure which results in skills for reaching aesthetic, psychological, sociological, symbolic, personal, and cultural meanings in art. Thus, it becomes imperative for formalized talk about art to include perceptual skills in gathering and distinguishing visual facts (Feldman, 1973) as well as the conceptual skills of ordering, sequencing, and differentiating information (Hamblen, 1986) in order to more fully understand and/or appreciate visual imagery of all kinds.

Synthesis Of The Foundations Of Advertising

A synthesis of advertising revealed the essential content base of advertising which shaped the critical model. The central questions concerned the reasons for advertising and, at the same time, the strategies that advertisers put into practice to accomplish their end: the selling of products and services which advertising has convinced consumers they want and need.

In view of the nature of advertising imagery, it was important for the art critical method to be one that accommodated the following components of advertising imagery: 1) its history, 2) its purpose in a capitalist society, 3) its function in society, 4) its effects on society and consumers, 5) its form {elements of layout design, principles of layout design, visual tools}, 6) its content {picture/illustration and text}, 7) its strategy and message {psychological appeals, emotional needs, basic needs, perceptual devices, audience targeting), and its gestalt.

In addition it was necessary for the critical structure to provide for the inclusion of several specific characteristics that are inherent in the form and content of advertising. First, advertising is designed to elicit a heightened emotional response that affects the viewer either overtly or subliminally. Second, advertising is loaded with a variety of contextual information (historical, cultural, social, economic, aesthetic, and psychological) which affects the form and content of the image as well as the viewer's response to it.

Teaching And Learning Models That Impart Thinking Skills

Psychologists and learning theorists have made many attempts to describe the intellectual development of individuals from birth to adulthood. Knowing about these theories in cognitive development, whether based in human development, perception, or learning, was relevant in order to discern the important thinking considerations necessary in selecting the stages for a model to examine advertising imagery.

Human development, perceptual models and theories of learning as espoused by Jean Piaget, Lev Vygotsky, Benjamin Bloom, David Henry Feldman, Jerome Bruner, Rudolf Arnheim, and Howard Gardner were assessed in relation to critical thinking skills in an educational context.

A synopsis of the selected theories of human development and learning indicated that the process of learning is hierarchical and that the components of any critical framework should be hierarchical in its approach to content. All models showed that human development proceeds from the general to the specific, from simple to complex, from concrete to abstract, and from the subjective to the objective, and in some cases, back to subjective/evaluative, but based on established criteria.

In selecting and/or developing the critical method, it was important to consider other developmental and learning skills gleaned from the information discovered in teaching and learning theory. The following list identifies several important concerns:

1. Knowledge is a building process. Therefore, incoming information should be related to previously acquired information.
2. Particularly at the more advanced stages of learning,, individuals learn through interactions with their peers. Therefore, it was necessary to include such activities as direct instruction, modeling, and adult paradigms in planning activities.
3. Some knowledge is culture specific, i.e., individuals are confronted by dominant forces which affect them on many levels. Therefore, it was important to provide ways for identifying and understanding such influences so that informed decisions about choices in life and in society could be made.
4. The most effective learning takes place when learning

activities proceed from memory-based recall to abstract ways of deciphering information and then using the new information to fit various other situations. For such instances, it was necessary to sequence learning activities that begin with knowledge acquisition and proceed through succeeding stages akin to comprehension, application, analysis, synthesis, and evaluation.

5. Retention and application rely on activities that utilize content which personally affects individual concerns. In other words, learning needed to be made relevant.

6. Sequential learning experiences that provide readiness, arouse interest, and promote intuitive responses aid in grasping the overall meaning of a subject through the relation of parts to the whole experience.

7. Intuitive thinking is an essential part of productive thinking in both academic disciplines and in everyday life. The use of guessing-type games could be used to stimulate intuitive thinking.

8. Learning general information first provides anchoring points for specifics. This was especially important for activities that relied on inductive reasoning for the discovery of information.

9. Bring closure to a learning experience is important for comprehension. This could be accomplished through seeking new information or rearranging old information.

10. The three systems of making, perceiving, and feeling share an independent existence at birth. As one develops and matures, these three discrete systems gradually influence each other, culminating in an interaction where each system inevitably involves the other ones. Therefore, it would become important to devise tasks that confirm these structures. This can be accomplished through pedagogical intervention, questioning strategies, and purposeful qualities that guide the experience.

11. Individuals in a classroom setting are more likely to reflect different learning styles and levels of developmental abilities. Thus, it would become necessary to structure learning activities so all participants benefit from the learning experience.

12. Knowledge acquisition can proceed from intuitive to symbolic, notional, and formal. Learning experiences could be planned that involve a) creating and perceiving, b) reading and describing, and c) judging and valuing.

13. Thought and feeling are part of intellectual and emotional development. Individuals possess behaviors that encompass likes and dislikes, attitudes, values, and beliefs. Therefore, objectives could be devised that attend to a phenomenon, respond to it, value it, to organize, categorize, and select the best from a group of effects, and to characterize by judging and revising.

14. Sometimes, psychomotor behavioral patterns become necessary to finely tune, for example, eye-hand coordination. Therefore, hands-on activities can be utilized to perfect relevant techniques related to specific matter areas.

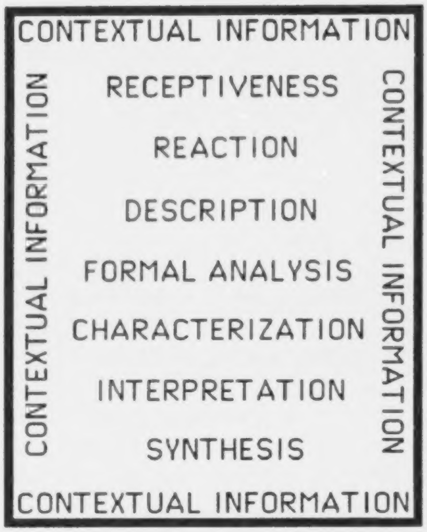
Overview Of Art Criticism Models

It was conceivable that any method of art criticism before reviewing a number of methods could have become the framework for examining the form and content of advertising imagery. However, all the pertinent information needed to fit the basic components of advertising imagery was not found in any one method, but parts were found in several methods.

Pedagogical methods of art criticism were examined in light of previous information gathered through a review of advertising literature. Each method was examined and analyzed for its potential strengths and weaknesses and general potential to serve as part of the final framework. The following is a list of the methods reviewed and the stages that make up each:

1. Edmund B. Feldman's four stages of description, formal analysis, interpretation, and evaluation (Feldman, 1970).
2. Ralph A. Smith's four stages of description, analysis and characterization, interpretation, and evaluation (Smith, 1968).
3. Robert Clements' scientific inductive method which utilizes the three stages of a) observing the significant facts, b) hazarding a hypothesis which accounts for the observed facts, and 3) testing the truth of the hypothesis against new and observable evidence (Clements, 1979).
4. Per Johansen's student-teacher dialogue for aesthetic discerning which involves the three stages of impression, expression, and commitment (Johansen, 1982).
5. Louis Lankford's phenomenological method of the five stages (arranged in sequence, but not mutually exclusive) consists of receptiveness, orienting, bracketing, interpretative analysis, and synthesis (Lankford, 1984).
6. Tom Anderson's contextually funded method composed of the five stages of reaction, perceptual analysis, personal interpretation, contextual examination, and synthesis (Anderson, 1988).

A Model Of Art Criticism For Examining Today's Prominent Visual Imagery: The Advertising Image



The discrete stages are logically arranged to accommodate the various aspects of advertising content previously identified. The stages include the components most often used in the methods reviewed: description, analysis, characterization, interpretation, and synthesis. The other stages of receptiveness, reaction, and contextual information are borrowed from different methods reviewed because of their fit with research findings. The initial stage of receptiveness is borrowed from Lankford's method while the next stage of reaction is borrowed from Anderson's and Johansen's methods. The provision for contextual information is derived from the methods of Anderson and Smith. Smith provides for the introduction of contextual information early on, whereas Anderson leaves it for later use. Because of the nature of advertising and its pervasive influences, this model allows for contextual information to be introduced at the stage where it is necessary for clarification of the form and content of advertising imagery.

The following section identifies each stage of the model and is discussed along with the essential areas of advertising needed to examine the advertising image.

Stage One: Receptiveness

The initial stage of receptiveness prepares the viewer for the critical activity. It aids in leading viewers from a nonchalant acceptance of advertising to an informed critical awareness of it. Because viewers seem to accept advertising as a part of their normal everyday environment, they tend to overlook its persuasive influence. Therefore, it is necessary to use motivational strategies that allow for openness and receptiveness to the issues involved in advertising.

One way to increase awareness of advertising imagery is by content analysis. For example, one way is to assess the way ads are geared to certain age and cultural groups. Through a content analysis of these ads, viewers can describe what they see, what relationships are established through the interaction of the people, what stereotypes are evident, and what visual techniques have been used to communicate ideas. Viewers can also use the same information gained from the content analysis and compare the differences in the ways they are depicted in ads for different products or even within different magazines.

Stage Two: Reaction

In using an ad for the critical activity, the first question to be asked concerns the viewers' initial responses to the advertising image being assessed for meaning. Reaction is an intuitive and affective response to the advertisement. It is how the image makes the viewer feel, not what the image means, that is important. To elicit responses from the viewers, the following questions can be asked:

a. How do you feel about this ad?

b. What does it remind you of or make you think of?

By expressing their impressions, viewers make commitments about the ad and these commitments serve as bases for further discussion and analysis.

Stage Three: Description

During the stage of description, visual evidence is located and identified. It is during this stage that the viewer can also point out the ad's thematic and formal qualities. The initial reaction can be used to guide the selection of these qualities. This process should continue until all the necessary visual evidence is determined. If the visual evidence fits the initial responses, then the initial reactions are reinforced. If the visual evidence does not fit the initial responses, then it is necessary to readjust first impressions.

Ultimately, in relation to advertising content and form, description is the noting of components within the ad. For example, the viewers can identify the parts of the advertising copy (headline, underline or overline, body copy, closing, logo, slogan, tagline); the sequencing of the opening, the middle, and the ending; the visual tools (line, shape, color, texture, value, space); technical description; objects or things included in the ad; and the obvious thematic content.

Stage Four: Formal Analysis

The previous stage of description sets the stage for formal analysis. Formal analysis places emphasis on the relationships that exist between the themes, formal qualities, copy parts, and techniques identified during the previous stage of description. It is during this time that viewers are trying to make sense of the overall visual structure of the image (in other words, its gestalt).

During the operation of formal analysis, viewers critically examine the formal relationships that exist within the special qualities of the ad. In searching through the visual evidence in the ad, viewers make note of the relationship between the visual (picture or illustration) and the copy of the ad. Formal analysis allows viewers to note relational qualities not observed during their initial responses to the ad. Since an ad forms a gestalt, it is necessary to look at all parts in relation to each other and to the whole. This is especially needed in uncovering meaning in ads since advertisers embed meaning in image associations.

Stage Five: Characterization

Characterization is the point in the critical activity where viewers try to grasp the style, kind, and type of ad they are evaluating. Characterization is concerned with the intended impact of what is visually portrayed in the ad. The viewer gains access to the style or character of the ad in order to determine its expressive quality.

Advertising techniques that are useful in approaching formal characterization include metaphor, association, idealization, aestheticization, fantasy, signification, and ambiguity. These are ways advertisers control imagery to manipulate consumer needs, values, and behaviors.

Stage Six: Interpretation

Interpretation is the stage where viewers come to terms with meaning in relation to what is expressed in the visual qualities of the ad. According to Anderson (1988), interpretation is the creative explanation of the visual facts, with technical processes, relationships, and viewers' previous experiences all playing a part in establishing meaning. In other words, interpreting the work's meaning is through the visual evidence in relation to previous experiences. In all cases, it is necessary to reference meanings to the visual properties in the work.

In specifically relating interpretation to print advertising imagery, one can see how advertisers stage ads to serve some purpose and to make an impression on the viewer. Observations can be made about how advertisers use dissimilar things to elicit viewer response and action. Ways advertisers use both overt and subtle imagery to build ads that appeal to the basic needs and values can be addressed.

During this stage it might be important to group the qualities of the image into denotations and connotations. Denotative qualities become those that describe such formal aspects as color, shape, pattern, value, contrast, or space while connotations describe the feelings and emotions of the viewer when he/she interacts with the message of the ad. Denotations are indicators of external reality; connotations become the ideas and associations that are the result of the denotative features of the advertisement.

Stage Seven: Synthesis

Synthesis is the bringing together of all the descriptive, analytical, and interpretative components in conjunction with additional contextual information necessary to form an evaluation of the advertisement. At the same time, synthesis allows resolution of the viewer's initial intuitive/affective responses to the imagery represented in the ad. Evaluation and resolution bring together both personal and expert opinions to determine why advertising does what it does in the way it does it. During the stage of synthesis, determining if advertising really works, how it works, and why it works can be discussed. It is also possible during synthesis to use the ways advertising evaluates itself in order to discover the manipulative powers of advertising. Some questions that might be asked during synthesis include:

1. How have your feelings changed as the result of learning about the ad and advertising through a discussion of the formal and contextual factors that influence the ad and advertising?
2. What is significant about the ad for you? Why?
3. What is the ad's driving, persuasive quality? Why?
4. Does the ad do what it is intended to do? How and why?
5. Is the ad a good ad? Why? Is there oneness of content and form? How is the ad's ambiance expressed?
6. In what ways has the ad used manipulative techniques?
7. How do you feel about the way the ad is designed to manipulate you to buy the advertised product?

During synthesis, one can also look at the ways advertisers evaluate their ads. For example, the following four questions can be asked that relate to the AIDA formula:

1. How does the ad capture **attention**?
2. How does the ad arouse and keep your **interest**?
3. How does the ad suggest you reach a **decision and desire** for the product?
4. How does the ad get you to **act** on the message and buy the

product or service? In other words, how has consumer behavior been affected?

In order to finally evaluate the ad's truthfulness, the following questions may be helpful:

1. What kind of information has been presented in the ad? Is it credible?
2. What is the subject of the ad? How has it been presented?
3. What persuasion techniques have been used? How have they been portrayed?
4. Is the ad appealing to reason (intellect) or emotion? How?
5. Can claims be substantiated? How? Where?
6. What has been omitted? How does any omission affect the viewer? the ad?
7. What is the final message of the ad?
8. What does the ad suggest that you do?
9. With such information (as above), would you be influenced to buy the product or order the service? Will you be able to associate a certain idea with the product? Why?
10. Is the overall message more true than false or is it more false than true? Why?

Stage Eight: Contextual Information

Another important stage concerns **contextual information**. When and how should it be introduced? In this model it can be introduced during any phase of the art critical activity when it is needed to clarify external influences (cultural, economical, psychological) that affect the form and content of advertising. Contextual information calls attention to the "non-formal properties" (Eaton, 1988, p. 79) that are not found in the ad itself. In other words, in a societal perspective, it is necessary to understand the context of advertising from multiple viewpoints.

Eaton (1988) referred to Kendall Walton (an analytic philosopher) who addressed contextual examination as related to an art work's intrinsic and extrinsic properties. Information about the art work is just as important as what is portrayed in the art work. With advertising imagery, this is important because many of advertising's intrinsic features are the result of advertising's extrinsic information. Understanding an art work, an ad, goes beyond the "immediate perceptual experience" (Eaton, 1988, p. 89) that the viewer initially encounters.

Further, contextual examination does not separate form and content. Both are considered equally because they influence and affect each other. In forming a gestalt in advertising imagery, both the layout and the message determine the ambiance of the ad -- that specialness that mesmerizes the consuming public who "enjoys ads as an art form" (Leiss et al., 1986, p. 4). At the same time, advertising's overwhelming presence is a factor that needs to be dealt with (Leiss et al., 1986). By learning the extrinsic features of advertising, one will be better able to synthesize all gathered information to understand the power of advertising.

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Contextual information about advertising's history, its function in society, its pecuniary function in an economic system, and its effects and influences on society is necessary for gaining an understanding of advertising. Much of this information will need to be introduced by the teacher or person in charge. Specific examples include: 1) ways advertising is developed to reflect specific ideologies or value bases (e.g., claims of lifestyle, affluence, or status, attitudes toward gender roles) and cultural biases and 2) ways advertising (as well as other forms of mass media) performs four basic functions: entertaining, informing, influencing, and making money (Sandman et al., 1972). Further, examples of ads similar in product, format, intended audience, and approximate date can be compared. Ads about the same product gathered to reflect a span of time can be compared through ways advertising techniques have changed, how imagery has changed, and, at the same time, how the function of advertising has remained the same.

Where contextual information is placed in the critical process is dependent on the type, kind, and style of advertising imagery being examined. For example, it may be important to introduce the types of psychological appeals that advertisers use to influence viewers at the stage of formal analysis since this information may be necessary to characterize and interpret the ad's imagery.

Conclusion

Since the primary function of art criticism is to provide a structure to systematically examine art work, then this method of art criticism allows viewers to cognitively combine both intuitive perception and intellectual analysis, two basic interdependent components of the human mind (Arnheim [in Anderson, 1988, p. 36]) in uncovering meaning in advertising. It may even be possible to see a relationship between the stages of art criticism and the steps advertisers use when they develop an ad from the initial introduction to the product to be advertised to the final presentation of the ad in the printed format in some publication geared to a select audience. Critical thinking from either perspective provides rich possibilities in the examination of advertising. The critical process can be compared to sleuthing where one applies investigatory maneuvers to reach the depths of advertising.

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Computer Animation

For EFL Learning Environments

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Computer animation here refers to computer-generated, animated graphics that function as visual aids to instruction. Computer animation was first developed in the mid-sixties as a means for film production. The early films were produced using programming languages or interactive systems accessible only to computer scientists (Thalmann, 1990; p.17). However, in the last few years, with the rapid development in computer applications as well as the rise in popularity of the GUI-based authoring systems, it is now possible for the average classroom teacher to create some form of computer animation to be used in his presentation or student practice after just a few hours of training.

The equipment is available and so is the technology. As Kini (1994) observed, "Given that the computer is now a relatively common delivery platform for instruction, the opportunity exists to develop a wide range of visually rich learning environments, such as animated illustrations as well as interactive simulations" (p. 7). For educators who are vigorously seeking new and creative uses of computer animation in both instruction and practice, the sky is the limit. Virtually every field of study is filled with opportunities for potential productive use of computer animation.

One such field is the EFL (English as a Foreign Language) learning and performance environment. Traditionally, students learning English in non-native environments had to depend only on texts and audio materials (cassette tapes, records, etc.) for learning and practice. The use of film and video in EFL situations was a giant step forward. However, the sequential nature of these media plus the lack of interaction leaves EFL teachers and learners alike much to be desired.

Our sense of vision represents our richest source of information of the world (Sekuler & Blake, 1985). The visualization quest has found the perfect canvas for painting daring wishes on the computer screen and made long cherished dreams come true. As Rieber (1994) notes, computer learning environments pose particularly exciting and demanding situations for visual communication, and that the range and diversity of visualization that computers offer are unprecedented (p. 8). And lying at the core of the great diversity of visualization computers can offer, is the immense attraction and infinite potential of computer animation. To future EFL learners, all that may be said and the dynamics of the English-speaking world will be just a mouse click away.

Classification of animation

As is the case of almost every field of research, studies of the past few years, as summarized by Rieber (1994, p. 154), have already generated quite a few colorful and often self-explaining terms, though no less confusing, such as animated visuals, animated graphics, cosmetic and motivational graphics, data-driven animation, real-time animation, fixed-path animation, command-driven animation, and interactive dynamics.

Before exploring possible effective ways to incorporate computer animation into CBI programs for EFL learning environments, it is necessary to find out what computer animation is, what variety of functions it may play, and how it is created. To answer these practical questions, this section will discuss the classification of animation by focusing on three aspects:

- Definition of computer animation.
- Classification by function.
- Classification by design.

Definition of computer animation

EFL teachers interested in creating or adopting animation into CBI programs are often troubled by not knowing what animation is. According to Rieber (1994), animation is "an illusion that tricks a person into seeing something that really is not there" (p.78). He further states that the trick to inducing the perception of a "moving" object on the computer screen involves creating a series of carefully timed, "draw, erase, move, draw" sequences (p.78). Thalmann (1990) also notes that animation "refers to the process of dynamically generating a series of frames of a set of objects, in which each frame is an alteration of the previous frame" (p.3).

Animation, as described above, primarily involves the perception of motion on the screen. Such motion may be represented by that of a "moving" object, or a growing or shrinking geometric shape.

Motion, no doubt, constitutes the very essence of computer animation. By the broadest sense of the word, anything non-static, involving either physical changes (in position, shape, size,...) or status changes (such as color, lightness, font, ...) over time, may be regarded as a form of animation. The frequent and common applications of techniques such as flashing, color change, high-lighting or deeming, and changing fonts of texts in many of today's CBI programs are all evidences of the rich and diverse use of today's computer animation technology. With the help of the many high-level authoring systems, the door to sophisticated animation creation and usage have been pushed wide open to ordinary EFL classroom teachers.

Classification by function

Since computer animation falls under the general category of graphics, and the issues concerning the application of animated visuals in education are quite similar to those of the static visuals (Kini, 1994, p.8), an understanding of the functional classification of computer animation should begin with a brief review of the functional categories of graphics. Alesandrini (1984) classified graphics into three types: representational, analogical, and arbitrary.

Representational graphics share a physical resemblance with the object they are supposed to represent. Analogical graphics show something else and imply a similarity. Arbitrary graphics share no physical similarity with the things they represent, but illustrate logical or conceptual relationships using a variety of visual and spatial means (Rieber, 1994, p.26).

Rieber (1994) identified five applications of instructional graphics: cosmetic, motivation, attention-gaining, presentation, and practice. These applications fall into two categories of functions, affective and cognitive.

Affective functions

Cosmetic and motivational graphics, classified as the *affective functions* of graphics, are designed to "improve a student's attitude toward learning or to increase the incentive of student to participate in the lesson" (Rieber, 1994, p.46). They serve to add to the "polish or decoration of a package to make a program more attractive or aesthetically pleasing" (Levin, Anglin, & Carney, 1987) so as to raise the general motivational level of a lesson. As Weinstock (1986) stated, "making software 'friendlier'... is the promise of computer graphics in many fields. Picture — especially moving picture — can be the sugar coating that makes information enjoyable, interesting, and better retained" (p. 247).

Cognitive functions

The other three types of graphics serve cognitive functions, and are designed to directly enhance the ability of students to learn from instructional materials. As learner attention plays such a vital role in making the difference between success and failure of any instructional event, "attention-gaining is an important initial event of instruction" (Gagne, Briggs & Wager, 1985), and animation can be an effective way of arousing and maintaining a learner's attention during CBI. Presentation graphics are those that are used to teach, to present information, or to illustrate procedures (Rieber, 1994). Graphics (static or animated) used in practice activities function as visual prompts, feedback, or navigational devices.

Classification by design method

As far as production is concerned, computer animation may be grouped in two different ways. By the production approach, computer animation is either command-based or GUI-based (graphic user interface). However, by the design method, computer animation may be grouped into fixed-path animation and data-driven animation.

Fixed-path animation

Fixed-path animation may be either command-based or GUI-based. Rieber's (1994) description of the key features of this type of animation are "the same exact animation is supposed to happen the same way, in the same place, at the same time, each and every time the sequence is executed" (p.77). This type of animation is pre-programmed or designed by the software developer, and is incorporated into the CBI package before any user ever touches the program. Each instance of fixed-path animation is activated at a specific point of the program. It may be executed automatically or by the user. Each time an animation is activated, the user always sees exactly the same thing displayed on the screen. Most, if not all, of the animation created using authoring systems belong to this type.

Data-driven animation

Data-driven animation, the animation of objects based on constantly changing program values such as student input (Rieber, 1994, p. 16), may also be either command-based or GUI-based. Since this type of animation is controlled by the constantly changing data resulted from calculations based on user input, it allows the user to alter the paths, the sequences, and the direction of movement of the animated objects by simply modifying the input data.

To incorporate data-driven animation into CBI programs, software developers are responsible for deciding which objects on the screen should be animated and under what conditions such animation should occur and how many variables should affect the animation process. However, once the user takes over, animation occurs when the controlling variables obtain the needed value. Which object is animated and how it is animated depends totally on the values of the variables at the time. The designer of the package has no control over either the sequence or the scope of the animation.

Unlike fixed-path animation which is characterized by repetitions of the same sequence, data-driven animation allows virtually an infinite number of variations for each animation process. And, because of the instantaneous and interactive features of data-driven animation, we may assume that it would produce better results in self-paced performance oriented presentation packages as well as in all sorts of practice centered CBI programs. Of course, such assumptions should always be tested through well-designed and properly administered future studies before anything can be said with certainty.

In the context of computer animation production, two other terms are also used very frequently: frame-by-frame and real-time animation.

Frame-by-frame animation is regarded as "the oldest form of animation" and represents, in fact, the most important fundamental principles underlying all types of animation. Rieber (1994) defined the technique as "when a set of successive frames is constructed so that when shown in rapid succession at just the right rate, one or more objects appear to move." Each of these frames is exactly the same as the previous one except the object or part of an object being animated (p.83). If these frames are displayed at a rate of just around ten frames per second, the animation process appears jerky, as seen in most animated cartoons. However, if the rate reaches 30 frames per second, animation achieves the quality of standard video display as seen in full-motion pictures.

Real-time animation occurs when the computer is able to display graphic frames in a quick enough succession to produce the illusion of motion (Rieber, 1994, p. 13). Motion in this context means full motion as seen in motion pictures or in real life. Truly motion-picture-like real-time animation requires an enormous amount of data storage space and high speed through-put (data transfer) rate. It will probably take quite some time before animation can truly be generated and displayed in real-time in practical classroom use. The term "real-time animation" nowadays is usually used to refer to the type of computer-generated animated graphics found in various simulations, video games, and the increasingly popular virtual reality packages.

Computer animation for EFL

Language teaching has been one of the earliest in educational settings to use micro-computers. However, surprisingly, looking for existing literature on the effects of computer animation in EFL situations was a disappointing experience. No reports were found of any previous studies done in this area, and it does not take too much research to find out why. In the majority of developing nations where EFL programs primarily exist, computer access for scholarly research is still a luxury, while general use of computers for instructional processes and by the learners are yet to be desired. Few instructional designers are equipped with both EFL experience and adequate computer skills to tackle the problem.

Despite the rather mixed and inconsistent results from studies done in the past ten years (Rieber, 1994, pp. 154-5), it is generally believed that computer animation, when appropriately employed, enhances learning. We know from Dale's Cone of Experience (Dale, 1969) that verbal symbols are among the most abstract forms of learning and are by far the farthest removed from reality. Appropriate use of animation would help create not only an added sense of reality, but also a higher level of learner participation and interaction.

Even though the lack of empirical support allows no exclusive generalizations, the authors experience with and familiarity in EFL procedures tends to suggest that the use of computer animation in EFL programs has great potential for success. Given the label-learning and fact-learning (Gagne, Briggs, & Wager, 1992) nature of much of EFL processes, computer animation is an ideal way of providing the visual system needed for facilitating learning as described by the dual coding theory.

A number of EFL processes appear to stand out as possible areas for producing positive results in the use of computer animation. When judged by the need for external visualization test and learning of the content depending on understanding motion or direction of motion (Rieber, 1994) criteria, the most promising areas may include the teaching and learning of beginning English phonetics, action verbs, and certain cultural elements.

Beginning phonetics

Learning English phonetics in non-native environments is often regarded as an abominable task. Learning to accurately distinguish and reproduce a set of foreign sounds requires, first, a thorough understanding of the mechanisms of articulating those sounds, a knowledge not needed for first language acquisition and is thus generally new to all learners. Second, in an attempt to explain to the learner what actually happens and how to do it, EFL teachers usually resort to highly specialized linguistic terms plus complicated phonological rules, which, more often than not, only add more complexity and difficulty to the job. The task is further complicated by the need to detect the seemingly indistinguishable similarities and the subtle differences between sounds in the learner's native language and those of English, for by the time the great majority of EFL learners start learning English they are already fluent speakers of their native languages.

To a large extent, the general inaccuracy of pronunciation commonly found in EFL learners speaking English results from the "blind" training (lack of means for visualize the articulation process) during the initial sound stage of EFL learning.

For learning this new set of sounds, behavioral theories traditionally require repeated mechanical listening and imitating so as to form a new habit of articulation. However, with the cognitive learning theories emphasizing learner understanding of the process, more and more EFL teachers and researchers feel that only audio materials and printed phonetic symbols are far from enough, and that visual aids for showing the mechanisms of English articulation are clearly needed.

The wide-spread use of static posters, video programs, and flash cards of articulation diagrams are evidence of such needs. Helpful as they have been all along, these traditional means fall short of the expectations in one way or another. Static posters and the flash cards fail to reveal the dynamic features of the sound-making process, while the analog video animation can be very expensive to produce and yet quite cumbersome to use. For quick and inexpensive production of instructional packages that show motion as well as the dynamic coordination of different speech-making organs during the process, while allowing maximum flexibility and ease of use, computer animation is clearly the best choice to date.

With knowledge of English phonetics, experience in instructional design and software development, and skills of computer programming, animation could be created to show the position of articulation, the speech organs involved, the dynamic procedures for correctly producing each and every individual sound in English. Ideally, such a package should include most or all of the following features:

1. Displays articulation position.
2. Highlights articulators involved.
3. Visualizes the direction of movements.
4. Separates the steps of movements.
5. Allows low/normal speed adjustment.
6. Shows sound changes in sequences.
7. Provides synchronized voicing.
8. Facilitates interactive practice.

Being digital, computer animation programs provide almost instantaneous access to any desired portion of the whole package at the click of a mouse. Especially with the proposed on/off synchronized voice features, possibilities for self-paced practice or post-tests are virtually limitless. And, best of all, both teachers and students will be rid of the burden of talking and hearing about phonological rules and articulation mechanisms even before saying the sounds correctly in English.

Words of motion

Words of motion here refer to the large number of English vocabulary items that denote movements, change of status, or performance of a doer (usually a human subject). Especially in the case of learning the differences between or among synonyms, the use of computer animation may prove to be very helpful. Examine the following words:

devour nibble munch crunch
sip quaff gulp bolt gobble
swill pull drag
scratch rub scuff scrape
stroll roam ramble
collapse fall apart
eruption explosion
flip flop
glide slide creep sneak slip

Of course, the list can go on and on. The point is: for EFL learners, those subtle differences between synonymous term are among the hardest to learn. For demonstration purposes, some of the easily-confused items are listed side by side for comparison. At the mere mentioning of each of these words, native speakers can quickly come up with a number of ways or examples of its usage. But the average EFL learners do not have the same background. They need to compare and contrast with other similar terms to pin down what a particular item means and where to use it.

Suppose the learner encounters the word "gobble" in reading, and the contexts suggest that it means a way of eating something, but he wants to find out its exact meaning. He may learn its meaning through reading extensively over a long period of time, or he may look it up in a dictionary, or consult his well-trained teacher (if indeed he has one.) But being able to see animated visuals depicting the various use of a word along with example sentences either read or printed on the screen or in both forms at a click of a mouse appears a lot more convenient, and promises much better results.

It should also be noted that once such a package is created, it makes it possible to test the learner's mastery of these words by showing the animated visuals, or visuals along with a test question. Such methods may also be used to supplement or substitute the controversial native language prompts or the never under-used multiple-choice questions.

Cultural elements

From even the very first day of learning a foreign language, the learner begins the never-ending task of learning the culture at the same time. And the amount of cultural exposure often has a direct effect on the quality of the language learning outcome. Learning English in non-native environments presents many difficulties, with the cultural aspects being by far the most difficult.

Many factors--unavailability of materials, strict political censorship, technological underdevelopment--may indeed be responsible for creating such difficulties. The bottom line is that EFL learners oftentimes do not have a clue of what things are like in English-speaking cultures. What is common-place to native English speakers may take the EFL learner years of reading to obtain only a vague idea. Thanksgiving to the average EFL learner in China sounds just as ambiguous as the Moon Festival to American students learning elementary Chinese. The learning of a lot of concepts and facts may be effectively facilitated with static graphics, but when it comes to learning words or expressions denoting procedures, performances, and directional movements, computer animation is clearly the choice.

Computer animation may be used in a number of areas to enhance learning of cultural information. The rich and colorful gestures and facial expressions many Americans adopt while speaking is one such area. It is possible to demonstrate through animation the meaning and use of each and every gesture specific to English speakers, so that EFL learners from Thailand are aware that an American signals "come over here" the way people do to call their pet dog in Thailand. And, EFL learners from China may learn from such programs that what they do in Chinese to mean "I am thinking" is actually interpreted by an American as "you are retarded". With the help of such animation, all EFL learners would be able to make use of the abundant paralinguistic information to improve their understanding of spoken English, as well as to eliminate some of their "foreign accent" in speaking English.

The correct use of silverware and the appropriate table manners are another area that computer animation may be effective for helping EFL learners learn the culture. In addition, digitized video clips of various social occasions, festival celebrations, daily greetings, religious events, and more could be used to create a carefully sampled cultural reality to give more meaning to the EFL learning experience.

Developmental considerations

A number of issues --the choice of programming language or an authoring tool, cultural considerations of target users, operating environment, hardware requirements-- need to be resolved at the initial developmental stage of creating computer animation for EFL use. Answers to these general questions may vary from project to project. However, for each specific event of instruction within a package, the designer is faced with more concrete questions such as "Is animation necessary?", "What type of animation should I use?" and "What other resources should I use along with animation?"

Animation or no animation?

As Rieber (1994) points out, the first principle of the design of instructional graphics is this: There are times when pictures can aid learning, times when pictures do not aid learning but do no harm, and times when pictures do not aid learning and are distracting (p.3). Clearly, the very first decision the software designer needs to make is whether or not to include any animation at that particular point of the program.

Since animation is mainly added to enhance learning, the designer may start a needs analysis by trying to predict the learning effect of animation. Rieber (1994) suggests that animated visuals pass the test of a need for external visualization, and the test of learning dependent on the understanding of motion or trajectory (the direction of movements) (p. 148). The designer should also consider whether animation would help motivate the learner or retain learner interests. If indeed animation is needed, the designer then faces the question of how much (both the size and the duration of the animated object) animation is appropriate. Before reliable empirical data comes up with detailed procedural guidelines, common sense would dictate that brevity reflects good judgment.

What type of animation to use?

The type of animation to be included for a given event depends largely on the function of the animation and the authoring system at use. Unless animation serves to display the results of a learner activity monitoring system, and/or to reinforce, or as a feedback to, learner interaction, data-driven animation may not be needed. Fixed-path animation is generally a lot easier to create and to control. Professional software developers with special training may want to use programming languages like the "C++" to get more versatility. But for producing teacher-made course-related instructional programs, the authors strongly recommend using high-level authoring tools (such as *Authorware*, *Superlink*, *Toolbook*, & *Linkway Live* on DOS machines or *Hypercard* on Macs) and creating fixed-path animation with skillful use of color change and other visual effects.

What other resources to use?

Creating animation can be a very time-consuming process. It is usually a good idea to plan in advance and do some research before starting everything from scratch. Many authoring systems provide good collections of ready-made clip-art and conversion programs for bringing in graphics from other systems. There is also an increasing list of commercially available CD-ROM clip-art collections. Color scanners may also be used to build customized collection of visuals. In any case, making use of existing materials saves time and helps improve the quality of the finished project.

For EFL learning, existing videos and laserdiscs are a gigantic supply of resources. Learning to use the capture function well or becoming skillful with quick video technology would give the designer endless choices of animated visuals to be incorporated into his instructional or practice programs.

With the arrival of the multimedia personal computers into schools and the homes, EFL software designers now have the luxury as well as the challenge to make use of the digitized voice technology to add a new dimension to their programs. Whenever possible and appropriate, voice messages, audio track of the EFL materials being presented, music and other sound effects should be actively adopted to help make the EFL learning environments truly audio-visual, so that the combined effects of the dual codes help bring about the best results.

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Using Visuals To Develop Reading Vocabulary

by Marilyn J. Bazeli
Ruth E. Olle

Introduction

For decades, reading professionals have been plagued by questions about the basic processes of reading and their underlying components. Vocabulary development has been found to be an integral element in the development of reading comprehension.

However, teachers have sometimes felt discouraged when their students seem to lack interest in reading instruction. Television, computers, and other visual distractions have often been blamed for that. When used creatively, however, those visuals can become valuable tools to help students learn to read, and also to increase their motivation to read.

A discussion of some research findings regarding vocabulary instruction and reading comprehension will be presented. Based on those findings, some methods to develop vocabulary will be suggested, centering around the visuals that are present and important in children's worlds today. Developing vocabulary through visuals can be just the motivation needed to involve students enthusiastically in reading.

Vocabulary Instruction and Reading Comprehension

Vocabulary development has been an important concern to some researchers. They have found that knowledge of word meanings has a strong relationship to reading comprehension. Some hypotheses regarding the relationship between vocabulary and reading comprehension imply that vocabulary instruction will directly improve comprehension, and that experience or first-hand knowledge of a concept is directly related to comprehension (Anderson & Freebody, 1981).

A review by Mezynski (1983) identified the following factors as related to successful vocabulary instructional methods for improving comprehension: a) the amount of practice given in learning the new words, b) the breadth of training in the use of the words, and c) the degree to which active processing is encouraged.

Stahl and Fairbanks (1986) conducted a meta-analysis of studies that reported the effects of vocabulary instruction on the learning of word meanings and on comprehension. Their meta-analysis looked at the methods' effectiveness by describing the effects of three method-specific factors on vocabulary instruction. These were: a) whether a method gives the student examples of each to-be-learned word in context, b) the types of activities that are required to learn the word, and c) the number and type of exposures to information about each word. Stahl and Fairbanks' model-based meta-analysis concluded that vocabulary instruction does appear to have a significant effect on the comprehension of passages containing words taught. However, this significant effect of vocabulary instruction on reading comprehension was not found with all teaching methods. Methods that provide only definitional information about each to-be-learned word did not produce a reliable effect on comprehension, nor did methods that gave only one or two exposures of meaningful information about each word. However, their meta-analysis revealed that the mixed methods, both of definitional and contextual information about each to-be-learned word, produced the highest effects on comprehension. The breadth of knowledge about each to-be-learned word was found to have strong impact on readng comprehension. Time allocation correlations were fairly strong for passage comprehension measures, which may mean that words need to be learned thoroughly for passage comprehension. Further, Stahl and Fairbanks point out that vocabulary instruction has stronger effects on inferential comprehension versus literal comprehension.

Carr and Wixson (1986) developed four guidelines for evaluating vocabulary instruction and specific procedures used for vocabulary instruction. These were: 1) Instruction should help students relate new vocabulary to their background knowledge, 2) Instruction should help students develop elaborate word knowledge, 3) Instruction should provide for active student involvement in learning new vocabulary, and, 4) Instruction should develop students' strategies for acquiring new vocabulary independently.

A summary of research would suggest that teachers should provide well-developed vocabulary lessons, including multiple opportunities to interact with words in a meaningful context (Koskinen, Wilson, Gambrell, & Newman, 1993). Classroom teachers need to be attuned to the latest in technological advances to make the best use of available resources for vocabulary instruction. Our world is becoming more and more visual, with visual communication becoming more dominant than print communication. Teachers need to relate written and visual learning.

Recent research in the area of cognitive theory has found that people store information that they receive via experience. This information, received through the senses, is stored in the form of schema which is "an organized network of concepts embodying some aspect of knowledge" (Durkin, 1989, p. 441). Roboch (1994) believes that, because of the large amount of information and images that children today receive, many children "have trouble maintaining schemata in order to develop the skills of reading and writing" (p. 3). The technique of visualization can aid the child to ground language in his/her own thought processes (Roboch, 1994). Roboch further states that there are two factors which can contribute to a child's inability to process language and vocabulary effectively: 1) some children do not have concrete experiences needed to give meaning to vocabulary, and 2) some children have information overload caused by too much abstract (spoken) language.

Thus, it appears in research that vocabulary instruction is necessary, and it can lead to improved comprehension. Also, there appears to be a strong need to relate concrete visual experiences to vocabulary development, providing active, meaningful, and repeated word use. Active involvement, concrete examples and attention to abstract concepts are a necessity.

Visual Methods for Developing Reading Vocabulary

Following are some practical visual methods for developing vocabulary. All of these methods involve students actively and concretely in their own reading vocabulary development.

Video

Some recent vocabulary instruction methods involve reading from captioned video through the television screen (Koskinen, Wilson, Gambrell, & Neuman, 1993). They have found that students want to watch captioned television, feel confident processing information from a familiar medium, and seem to attend to the semantically rich and multisensory context.

An extension of utilizing prepared captioned television would be for students to produce their own videos, with captioned vocabulary words and pictures or live action to illustrate the vocabulary. A short story could be presented, using either pictures or a live play format with students acting out the parts, and printed vocabulary words interjected at appropriate points of the story. Only a few words would be presented, and would be repeated for increased retention.

Another example of using video to develop specific vocabulary would be to use student-created stories, which would be read (or acted out) in front of a video camera. Specific vocabulary words would be stressed orally, and a card with the printed word held in front of the camera would focus the viewers' attention on the written form of the word. This activity would provide a rich basis for using the vocabulary words in a real-life and meaningful situation.

The video productions described above could be saved and used with future classes or for review. Thus, eventually, a library of specific vocabulary videos could be assembled, with great motivational impact because of the student production.

Drawing

Using art as a tool for improving reading is not a new idea. However, Roboch (1994) states that, "by coupling the abstract sound/symbol (in the form of written work) to the student's drawing, the appropriate connection is made between the word and its meaning" (p. 3). Drawing in connection with vocabulary provides children with the means to think in the language by which they receive much of their information, that being the visual language.

That concept can be applied in various ways. Students could simply illustrate specific assigned vocabulary words (one or two per student), which would then be assembled and collectively would represent all of the vocabulary specific to a particular story.

Students could be asked to illustrate words from a story they read by themselves, or to illustrate a passage of the story. This is an excellent way for students to engage visually with the story, and for teachers to evaluate the understanding of the students regarding vocabulary words on their comprehension of a passage (Neu & Stewig, 1991). The visual retelling of a story is a wonderful way to vary the informal assessment of comprehension.

Computers

Currently, there are many computer programs which have been designed for the stated purpose of developing vocabulary and reading skills.

The Broderbund company has produced several software packages for the computer in the area of reading and whole language. Their Living Books, on CD-ROM, were developed with the aid of classroom teachers, reading specialists, and curriculum experts. While each of these CD-ROMs encourage reading and provide teacher materials for whole language experiences, the learner is also highly involved with visual images.

Discis Books, another CD-ROM series, is also a highly successful approach to reading. Students can interact with individual vocabulary words by having them pronounced for them (in several languages), or the entire text can be read to the students. Additionally, students can select specific items in the illustrations, and that item is named and defined.

Computer drawing programs can be utilized for vocabulary development also. Students can create a visual with the computer to illustrate a specific vocabulary word. The process of creating an accompanying visual provides practice with new vocabulary, and promotes encoding of that new vocabulary into long-term memory.

Visual Perception

Another effective strategy to develop vocabulary is utilizing the skill of visual perception. As students become involved in actively analyzing pictures or book illustrations, they are putting to use much of the vocabulary they need to develop.

Graeme Base's book Animalia provides an excellent array of visual representations of thousands of vocabulary words. On each page, a letter of the alphabet is presented, with an alliterative phrase. Depicted on each page are sometimes as many as a hundred objects that begin with that letter. Determining the name of each object in terms of the correct beginning letter is fun, challenging, and motivating. Young children to adults can be captivated by this activity. A variation of using the book itself to develop vocabulary is to have students create their own, with a selection of drawings illustrating vocabulary words beginning with the appropriate letter. The research involved in finding the name of an object, drawing it, and seeing if a classmate can figure it out can be a fun and effective vocabulary activity.

Another activity involving visual perception could be to present each student with a list of specific vocabulary words (perhaps some that are currently being focused on in a particular story). Each student would then select four or five words, create a visual of each that would be combined into one picture. Other students would employ visual perception skills to find the visual depiction of the vocabulary words within the complete drawing.

Goldstone (1989) has written about the need for visual literacy skills to aid "the scaffolding of images for the reader and help the reader to climb into the story." (p. 592). She believes that teachers should use the pictures in books to expand comprehension and promote vocabulary. She further believes that "being able to interpret visual images provides children with skills and the confidence to interpret the more symbolic form—the printed page." (p. 595). Thus, the use of visual perception skills in classroom activities can help students achieve effective reading skills.

Organizational Visuals

Graphic organizers of various types can be useful visual tools for the development of vocabulary. Using key vocabulary words as a structural basis for a mind-mapping activity regarding a particular story can not only enhance the recognition and meaning of the words, but also can enhance the comprehension of the entire story. A good graphic representation "can show at a glance the key parts of a whole and their relations, thereby allowing a holistic understanding that words alone cannot convey" (Jones, Pierce, & Hunter, 1989, p. 21). If those "key parts" are specified vocabulary words, students focus on those words and how they are an integral part of story.

Fitzpatrick (1994) advocates many critical thinking strategies to develop reading comprehension. One strategy she suggests in the use of story maps, to assist student in understanding how a story is organized. "Such maps can be created with words and pictures" (p.143). Thus, specific vocabulary words can be visually focused upon in such maps, not only aiding in vocabulary development but also in comprehending the story.

Word Sorts can be a powerful vocabulary development strategy within a comfortable group setting. "The process was identified by Gillet and Temple in 1982 as a way to help students consider a variety of word features by comparison and classification" (Olle, 1994, p.230). Word Sorts enable students to rehearse new vocabulary, to discuss various word classifications, and to develop convergent and divergent thinking through deducing the defining characteristics of words. As students work collaboratively to sort given vocabulary words into categories, they not only practice the pronunciation of the words, but also comprehend the meaning of the words. Further, Word Sorts involve the physical manipulation and hand-on experience that is missing from many other procedures for vocabulary instruction. Students are actively involved as they manually and visually sort, sometimes re-sort, and discuss the vocabulary words with group members (Olle, 1994).

Student-made flash cards, containing a vocabulary word and a picture can help in motivation and organizing learning. The typical flash cards with a printed word and definition are not very interesting to students in this visual world; however, flash cards with a graphic element added to represent or remind the student of the meaning of the printed vocabulary word are much more interesting. When the students can use their own visual creativity to select a visual, the motivation is dramatically increased.

Conclusions and Recommendations

The purpose of this paper was to present background and methods for use in the classroom with the visuals that have become a part of everyone's world. Visuals have great impact on students' lives, and can be useful tools to develop vocabulary and reading comprehension skills. The ideas presented here are only a few of the many that could be utilized in the classroom.

Most of the ideas presented would involve cooperative learning groups. Cooperative learning groups have been found to motivate students, increase academic performance, encourage active learning, and, of particular importance for this paper, promote literacy and language skills. (Adams & Hamm, 1990). Thus, the use of visuals, combined with cooperative learning groups, provides an especially effective environment for the development of vocabulary and reading comprehension. Even more importantly, enthusiasm and motivation for reading is heightened within the students when they employ visuals present in their world combined with cooperative groups.

It is recommended that strategies be implemented in the classroom to involve students in the creation and/or perception of visuals in connection with reading instruction. Making reading instruction part of the visual world we live in can provide excitement and enthusiasm within the classroom on the part of the students as well as the teacher.

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Mapping the Visual Communication Field

by Sandra E. Moriarty

The study of visual communication is a multi-disciplinary, multi-dimensional effort. People who write on this topic are in mass communication (including photography, advertising, and news editorial areas), film and cinema studies, educa-tion, art and aesthetics, anthropology, psychology, philosophy, linguistics, semiotics, architecture and even archaeology.

This rich melange of viewpoints is an asset because of the insights that come from cross-fertilization, however it causes some problems academically for those of us who teach visual communication because of a lack of any sense of common theory. This is not to suggest that there is or should be a central of core theory that organizes the field, however, it would be easier to order a curriculum, as well as a graduate program of study, if there were some notion of at least the important theories and scholars from the various disciplines that need to be covered.

This is Part II of a project that began last year. Part I looked at visual communication theory, primarily through a survey sent to IVLA members, as well as members of the Visual Communication Division of AEJMC (Association for Education in Journalism and Mass Communication), and people who attend the summer Visual Communication Conference. Part II, which is the topic of this paper, now looks at the body of literature and the categories that emerge from the writings to develop a taxonomy of topics and some sense of the location of the most important, or at least the most frequently written about, areas of study.

Review

But first let's look at a review of some of the major pieces of work similar to this effort. In terms of books, Probably the most important book specifically focused on visual communication theory is So Worth's series of essays which appeared in his landmark book, *Studying Visual Communication*.[1] Another important work is a book of readings called *Visual Literacy* edited by Moore and Dwyer, which comes from the educational media discipline but includes a number of essays that relate to basic visual communication theory, as well.[2] Paul Lester's textbook on visual communication is another important general introduction to the topic.[3] Rune Pettersson's *Visual Information* is a useful textbook that focuses more on information theory.[4] The Morgan and Welton book, *See What I Mean?* approaches visual communication from a communication theory perspective.[5] Arthur Asa Berger's *Seeing is Believing* is an introduction to visual communication from a more semiotic perspective.[6] John Berger's book, Ways of Seeing, is a series of essays based on a BBC television series by the same name.[7] Artist Deborah Curtiss has written a book, *Introduction to Visual Literacy,* which explains how we learn to appreciate and use various aesthetic elements.[8] Communication scholar Donis Dondis also analyzed the basic elements of images and com-position in terms of syntax and visual literacy in her book, *A Primer of Visual Literacy.*[9] Most recently Paul Messaris's book also titled *Visual Literacy*, takes on the conventional view of visual literacy as a learned process similar to language and instead proposes that visual literacy is largely a natural process.[10]

Other important conceptual investigations includes a work by Braden and Baca, "Toward a Conceptual Map for Visual Literacy Constructs" that attempts to map the field of visual literacy in terms of basic concepts, as this report hopes to do for the broader area of visual communication.[11] An important theoretical analysis of the instructional/educational technology viewpoint was developed by John Hortin in his review, "The Theoretical Foundations of Visual Learning" in Moore and Dwyer's book of readings.[12] The visual literacy approach outlined by Hortin begins with verbal language as a fundamental model and focuses on the transactional processes by which we receive and transmit visual meaning. This approach reflects the work of many IVLA scholars.

Hortin's piece highlights the important work of John Debes[13] as a pioneer in this area, as well as scholars like Ruesch and Kees who developed a model of three kinds of nonverbal languages (pictorial, action, object) in their book on nonverbal communication.[14] Francis Dwyer's *Strategies for Improving Visual Learning* is another important early contribution in this area.[15]

Also in the Moore and Dwyer book is a review of visual literacy, thinking, learning, and communication by Barbara Seels.[16] Nikos Metallinos has also reviewed visual literacy theory relative to television processing in "Visual Literacy: Suggested Theories for the Study of Television Picture Perception."[17]

Some scholars have tried to identify the interrelationships between visual and verbal information such as Roberts Braden[18] who has developed a theory of visual/verbal symbiosis. Ralph Wileman has created a typology of verbal and visual image relationships.[19]

From an entirely different discipline, philosopher Nelson Goodman in his analysis of art, *The Language of Art*, also concludes that pictures represent reality in the same way that language does.[20] In other words, meaning is determined by convention and thus learned. The Morgan and Welton book, *See What I Mean?* also presumes that visual appreciation is learned.[21]

In contrast to the viewpoint of Nelson and most of the IVLA scholars, communication scholar Paul Messaris's argues in his book *Visual Literacy* that people become visually literate through a process that is basically perceptual and innate rather than learned as is language. His premise, that visual literacy is a normal human condition, is also argued by Cassidy and Knowlton.[22]

Bibliographies and Taxonomies

A number of bibliographic studies have been done in the visual literacy and visual communication area. Probably the biggest effort is one by Howard Levie, "Research and Theory on Pictures and Imaginal Processes" which appeared in The Journal of Visual Verbal Languaging in 1984. Martin Oudejans broadened the topic in his piece "A Bibliography of Visual Literacy" which appeared in the same journal in 1987. Alice Walker has analyzed both IVLA conference proceedings and the Journal of Visual/Verbal Languaging (renamed the Journal of Visual Literacy) in articles in 1990 and 1991.

As mentioned earlier the findings of the first part of this study, which was a survey of people who teach in the visual communication area, were presented at this summer's Visual Communication conference. That survey asked visual communication scholars to cite the theoretical areas that provide them with a foundation for their work. As one might expect, the number of people who care enough to respond to a questionnaire about the views on theory was rather low and only 37 people provided usable responses. The data from that survey, however, was useful as guideline in developing this second attempt to map the field.

The respondents did mention, however, 17 theoretical areas as providing grounding for visual communication study. When the categories are collapsed, the largest number of mentions were found in the psychology category (49). This down into cognitive/information processing approaches (22), perception (195), and gestalt approaches (9). Another general category that is summarized here as "meaning theories" (semiotics/ semiology, symbolism) was second with 15 mentions. Visual communication, which emerged in this study as an area with its own body of theory--largely described as representation and imagery studies--was third with 14 mentions. A group of categories--aesthetics, mass communication, and cultural/critical theories-- were tied for fourth, followed by film/cinema studies in the fifth spot.

The exercise of coding and categorizing these responses led to the development of the first draft of a taxonomy. In order to better understand these categories and the body of literature represented by them, Part II of this study looked at the literature itself and tried to build a more extensive bibliography of visual communication in general--theory, research, teaching--as well as a taxonomy that was better grounded.

This Project

This project began by looking through the personal files of the two primary authors and building an initial bibliography based on these works. Then the authors moved to the library for a more systematic combing of certain journals--*The Journal of Visual Literacy* (previously known as the *Journal of Visual / Verbal Languaging*), *Visual Communication Quarterly* (a special section in the *News Photographer* magazine), *Studies in Visual Communication* (now defunct), the *AECT Journal*, and *Visual Sociology* and *Visual Anthropology*. After the important works in these journals were collected, then the third step was to go through the citations and references for all the articles collected in the personal files as well as in the articles. All of this work led to the development of a 95-page bibliography (single spaced) with some 1,617 entries organized into 13 major categories and a total of 90 subcategories. (See the Taxonomy in the Appendix).

All of the entries were assigned to categories that seemed to represent the focal point of the work. A number of them, however, crossed over to other categories so a second effort was made to cross-reference all these works allowing either one or two other subcategories to be indicated. Eventually when the bibliography is published, this information will be used to create a cross-referenced index.

The point of this paper is to present the taxonomy as developed for this project. The number of entries in the various categories will be computed to determine the ones that seem to have the most scholarly attention as well as the categories with the highest level of convergence--in other words, those that are being used in a lot of different studies in a lot of different areas. Next the cross-references were analyzed to see if the pattern is the same as the original assignments. Finally the original category assignments were combined with the cross references to determine the total number of works affiliated with each category. Once again, the aim was to determine the areas where the most work is occurring as is evident from this version of the taxonomy and bibliography.

The Findings

In terms of the original classifications, the 15 most popular (written about) areas are show in the table that follows on the next page.

When you look at those areas in the top 5 that were often cross-referenced, a different pattern emerges with memory clearly leading the list followed by a group comprised of imagery and photography, then cognition/ information processing, and visual/verbal interaction. This tends to suggest that certain areas (development, advertising) were the focus of a certain set of studies but were less frequently used as associated variables. Other areas tended to be used more frequently

Original Category Assignments

	n		
1. Development/Children	61	8. Gender Studies	40
2. Advertising	50	9. Creativity	39
3. Visual/Verbal Interaction	49	10. Art/Fine Art	37
4. Photography	48	". Aesthetics	37
". Cognition/Info Processing	48	11. Perceptual Cueing	36
5. Memory	43	12. Sociology/Anthropology	30
6. Television/Video	42	". History	30
7. Mental Imagery	41	13. Signs/Semiotics	29
". Visual Literacy	41	14. Graphic Design	28
". Perception	41	15. Publication Design	27
		". Film/Cinema	27

as variables such as imagery and memory. Photography, cognition/information processing, and visual/verbal comparisons appeared in the top 5 in both lists. The top 15 categories in the cross-referencing list are shown in the following table.

Cross-Referenced Category Assignments

	n	8. Film/Cinema	48
1. Memory	90	9. Advertising	47
2. Imagery	79	10. Pictorial Representation	46
3. Photography	78	11. History	40
4. Cognition/Info Processing	71	12. Perceptual Cueing	38
5. Visual/Verbal Interaction	66	14. Graphic Design	25
6. Art/Fine Art	56	". Photojournalism	25
7. Television/Video	53	15. Research/Methodology	22

Many of the categories appeared in both lists of 15 (photography, imagery, memory, cognition, visual/verbal interaction, art, television, advertising, perceptual cueing). The topics that are on both lists would be categories with the highest level of convergence.

The categories from the original list that didn't show up in the top 15 of the cross-referenced topics include development, visual literacy, gender studies, creativity, and aesthetics. These topics might be considered to be self standing areas or areas where there is less convergence across topics. A few categories only showed up at the top of the cross-referencing list (representation, photojournalism) and these seem to be used as foundation variables across a number of different studies.

Other topics that had 20 to 29 entries include information graphics, visual illusions, representation and realism, visual interpretation, physiology/ vision, pictorial perception, gestalt perception, comprehension, audio/visual/verbal interaction, symbols, publication design, typography, color, cross-cultural studies, ideology/bias, ethics and social responsibility, instructional media/ed tech, and new media.

When both of these lists are combined, you get a picture of the areas which are receiving the most attention in the literature. The top 25 list of the combined categories, which gives you a feeling about the breadth of the spread and the nature of the weighting of the topics investigated, is as follows:

Combined Classifications
(Original Assignments Plus Cross Referencing)

1. Memory	133
2. Photography	126
3. Mental Imagery	120
4. Cognition/Info Processing	119
5. Visual/Verbal Interaction	115
6. Advertising	97
7. Television/Video	95
8. Art/Fine Art	93
9. Perception	83
10. Development/Children	79
11. Film/Cinema	75
12. History	70
13. Visual Literacy	61
". Pictorial Representation	61
14. Graphic Design	53
15. Aesthetics	50
". Creativity	50
". Gender Studies/Stereotypes	50
16. Signs/Semiotics	43
17. Codes/Decoding/Encoding	41
18. Broadcast/TV News	40
". Research/Methodology	40
19. Audience Factors	39
20. Sociology/Anthropology	38
21. Rhetoric/Persuasion	37
22. Photojournalism	35
23. Journalism/News	32
24. Information/Content	31
25. Cartoons	30
". The Language Metaphor (syntax, grammar, etc.)	30

Topics that were noted in the teens include visual communication philosophy, visual thinking, imagery and perception, epistemology, psychology of art, attention and selection, hemispheres, dual coding, critical viewing, communication studies, visual metaphors and analogies, audience evaluation/judgment, education (general), instructional materials design, computers in education, and archaeology.

Bringing up the bottom of the taxonomy with nine or fewer entries are imagery and education, vividness studies, neural processing, Psychology (general), subliminal perception, pictorial superiority effect, media literacy, kinesics, perceptual aesthetics, aesthetic education, composition, graphic symbols, advertising design, corporate design, computergraphics, reading and writing, text and illustrations, educational TV/Film/multi-media, TV commercials, and architecture.

Conclusions

One observation is that the top of all the combined list seems to be dominated by foundation theoretical areas from *psychology* (memory, cognition/information processing, and perception) as well as *visual communication* (mental imagery and visual/verbal interaction). Three of the *professional areas* also ranked in the top 10 with photography at #2. and advertising and television/video at #6 and #7. Only one *educational* topic area appears in the top 10 and that is development/children's studies.

This list, as well as the way the taxonomy evolved, clearly demonstrates that visual communication has its own areas of theory and scholarly attention and that this literature base is nearly as extensive (242) as the psychology base

Major Areas of Focus

1. Professional Areas	297
2. Psychology	264
3. Art and Design	257
4. VisComm Theory	242
5. Education	216
6. Cultural/Critical Studies	185
7. Meaning Studies	36
8. Audience Factors/ Effects/Responses	36
9. History	30
10. Comm Studies	30

(264 which was determined to be the most important foundation theoretical area from the previous study.

The general area of art and design, however, was second in importance with 257 entries; education was also important with 216. Most of the writings (297), however, relate to the various professional areas that employ visual communication such as photography, advertising, television, and film.

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Wayfinding: You Are Here/You Are There

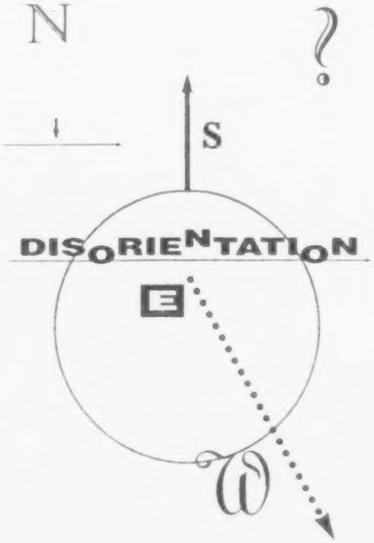
by Jacqueline Gommel

YOU ARE HERE

When we feel lost or need to go somewhere and don't know how to get there, we are in situations that can result in anxiety and stress. When we cannot "find our way", schedules are interrupted, appointments are missed, and time is wasted. Depending on the circumstances, our feelings may range from mere irritation and frustration to those of helplessness and panic. Uncertainty can quickly change to total disorientation, affecting our sense of balance and well-being.

Interior designers and planners are faced with the opportunity and perhaps the obligation to create environments in which people not only feel comfortable, but that can be understood easily. When we understand an environment, we are better prepared to successfully and safely find our way. As designers and planners, we must understand wayfinding and realize the important part it plays in our lives.

Although wayfinding activity has existed since prehistoric man first left his cave in search of food, it is only recently that wayfinding has gained importance and visibility as people strive for customer satisfaction and user-friendly environments. Facility owners and managers are rapidly coming to the realization that people prefer buildings where they feel comfortable and can find their way easily.



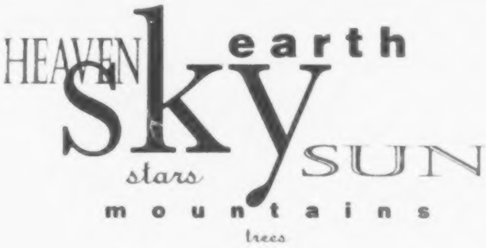
Throughout history, labyrinths and mazes have symbolized disorientation. Recently, these terms have been used to describe confusing environments such as hospitals, shopping malls, airports, and office buildings. As these facilities expand and become even more complicated, orienting staff and visitors becomes more critical.

TO BE ORIENTED
We
must
know
where
we
are.

According to Downs and Stea (1977), orientation is the first step in successful wayfinding (p. 125). To be oriented, we must know where we are. To know where we are, we must understand the world around us. To understand the world, we must identify the parts and comprehend the relationship between the parts (p. 53, 59).

Thousands of years ago, prehistoric man identified the things he saw around him by making crude drawings or carvings on cave walls.

He viewed his world in relation to the elements of nature:



As language developed, names and meanings were added. The unknown became known, chaos was transformed into order, and the world became manageable.

Most likely, maps evolved as a way to represent or symbolize this knowledge of the environment and as a means to communicate a sense of place, some sense of here in relation to there, (Wilford, 1981, p. 1). With this realization, the world became a structured space, a system of places (Norberg-Schultz, 1980, p.28).

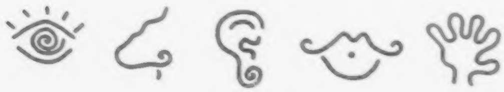
Through images, names and meanings we are able to grasp the concept of a sense of place. A sense of place is that comfortable feeling of being at home in, and belonging to, some particular part of the world. It provides a feeling of security which blends together past and future. A sense of place is essential to any ordering of our lives (Downs and Stea, 1977, p.27, 160, 240).

For years, scientists, behaviorists, and psychologists have studied animals and humans to better understand why they do what they do. In 1948, psychologist

Edward Tolman conducted what are now considered classic studies of the behavior of rats in mazes. Using two different maze designs, he observed how the rats found their way through the mazes to locate cheese.

Through these experiments, Tolman concluded that the rats actually organized and interpreted information from their environment to solve the problem of locating food. He proposed that the rats actually formed a map in their minds, a "cognitive map", to find the cheese (Tolman, 1948, p. 192; Downs and Stea, 1977, p. 35).

Cognitive mapping has been used to define the process that enables us to mentally organize or comprehend the world around us. Cognitive maps are formed by information from our environment that we obtain from our senses: sight, smell, sound, taste, and touch.



Lynch (1960) noted that nothing is experienced by itself, but always in relation to its surroundings, the sequences of events leading up to it, the memory of past experiences (p. 1).

Nothing is experienced by itself but always in
relation to its surroundings ,the sequences of
leading up to it , the memory of past

Downs and Stea (1977) explained that our cognitive abilities enable us to

ORGANIZE

recall

collect

STORE

interpret

information about our environment. We then combine all of the parts into an integrated representation of the world, as we believe it to be, in our minds. In doing so, we create a mental image, a cognitive map (p. 6, 27).

Over a decade after Tolman's studies of rats, architect Kevin Lynch studied how people living in Boston, Jersey City, and Los Angeles orient themselves. He found certain places were more "legible"; that is, they were easier to understand and organize into a coherent pattern (1960, p. 2, 3). He referred to "wayfinding devices" such as maps, street numbers, and route signs; but determined that it is physical form and arrangement which enable us to create a mental image of the environment. When image-making is difficult, we feel lost (p. 4).

In his book, *Image of the City*, Lynch identified five basic elements which contribute to the "legibility" or

"imageability"

of an environment:

1. *paths* people follow
2. *edges* of neighborhoods
3. socially or physically defined *districts*
4. *nodes* where paths cross
5. memorable *landmarks*

(Lynch, 1960, p. 46, 47; Malkin, 1992, p. 468). These five elements are still used in current discussions regarding wayfinding design and theory.

During the 1970's, the study of cognitive mapping continued. Professors Downs and Stea (1977) noted that when we go from where we are to some other place, we are involved in a complex process called wayfinding. Wayfinding, they concluded, is spatial problem solving.

According to Downs and Stea, wayfinding consists of four sequential and interrelated steps (p.125):

1

ORIENTATION

2

THE CHOICE OF ROUTE

3

KEEPING ON THE RIGHT TRACK

4

DISCOVERY OF THE OBJECTIVE

In the twenty years since Downs and Stea, there have been numerous others who have contributed significantly to wayfinding research. Representing backgrounds in urban planning, environmental psychology, sociology, architecture, interior design and environmental graphic design, their efforts have proven that wayfinding is not only a complex process, but a critical design issue involving several disciplines.

Passini and Arthur noted that to understand wayfinding is to understand how we use the information the environment provides: architectural, graphic, and verbal information (Passini, 1984; Arthur and Passini, 1992).

ARCHITECTURAL INFORMATION

GRAPHIC INFORMATION

VERBAL INFORMATION

Not only must different types of information be communicated, designers must realize there are different types of users. People rely on different types of information to solve wayfinding problems, which results in different wayfinding styles.

Some prefer linear or sequential information, as provided by signs; whereas, others depend upon spatial information, how a setting is organized (Passini, 1984; Arthur and Passini, 1992). The passing of the Americans with Disabilities Act (ADA) has also resulted in a greater sensitivity towards people who are impaired or disabled in some way.

WAY
finding
system

No one element can work in isolation; there should be multiple guiding and reinforcing cues. Architectural, graphic, and verbal information must be part of a well-developed group of elements all functioning together, known as a Wayfinding System (Carpman, Grant, Simmons, 1986; Malkin, 1992). Through an effective Wayfinding System, information becomes available and the environment becomes accessible to a greater number of people. Elements of an effective Wayfinding System are as follows:

1. Spaces that are well-differentiated or visually distinctive through the use of lighting, color or texture
2. Being able to see through a space or to the outside of a building to maintain a point of reference
3. A building layout that is easy to understand or remember
4. Memorable landmarks such as plants, artwork, and furniture arrangements
5. Signs, symbols, directories, and maps
6. Staff who are well-trained in the art of giving instructions.

(Passini, 1980b, 1984; Arthur and Passini, 1992; Calkins, 1988, 1989; Carpman, Grant, and Simmons, 1986; Carpman, 1987; Malkin, 1988, 1989, 1992; Weisman, 1981, 1989).

As hospitals, shopping malls, airports, and office buildings become more complicated and expansive, finding one's way easily, quickly, and safely are needs everyone will face at some time. Designers and planners must be trained to address these needs, to provide the right information at the right place, and to incorporate the appropriate elements which will make wayfinding easier for everyone.

This does not mean, however, that the environments we create should be simple. Dull, uninteresting environments provide little or no environmental information, causing the greatest problems in wayfinding. Distinctive environments are ones that make sense. Stimulating environments guide, enlighten, entertain, and educate us. Well-designed environments enable us to enjoy the experience of getting to "*there*" and that, after all, is what wayfinding is all about.

YOU ARE THERE

The preceding represents a summary of a document created for a Master of Arts degree in Interior Design at Northern Illinois University, DeKalb, Illinois. This degree required the presentation of a one-person show rather than a thesis.

The exhibit consisted of sixty 11" x 17" pages mounted onto 1/8" foam core board. This size was used because it would be better for viewing from a distance and could be easily produced on a basic office copy machine. Some of the images were enhanced using color copying, markers, and colored paper.

There were eight sections in the exhibit, with each section illustrating a certain aspect of wayfinding. These were displayed in multiple spaces which required the viewer to move from one distinct area to another, "finding their way" through the display.

Five of the eight sections were suspended from 1-1/4" wooden closet rods using utility hooks and fishing line. The rods were painted bright yellow, which not only contrasted with other colors in the space, but also became a unifying factor for the show. Additional display techniques incorporated tackable wall surfaces, photo boxes, and a commercial display unit used for trade shows. A wayfinding logo, initially created for invitations to the event, was combined with large numbers and used to identify each section.

Although the process of wayfinding is essential to our daily lives, little information exists which relates interior design and planning to wayfinding issues. If, as designers and planners, we must create environments which make wayfinding easier, then students should be exposed to these concepts as part of their basic education in design and planning.

Consequently the sixty pages of this exhibit were developed so they could be bound into a book for students. The larger format and bold graphic elements were selected to deviate from a more typical textbook appearance. Visuals and font selection were used to add interest and reinforce wayfinding concepts; for example, creating visual "landmarks".

This collection of material was designed to provide an overview, serving as a basic study guide or introductory primer on wayfinding. An extensive bibliography was provided (although not included here) to facilitate further research on the part of the student.

As designers, we must provide information that makes wayfinding easier for everyone. As educators, we must provide information that enables students to grasp the concepts crucial to effective design. Stimulating environments guide, enlighten, entertain, and educate us--so too, do stimulating instructional materials.

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Graphic design by Nancy Barlow.

The Learning Helix

Rune Pettersson

In companies around the world, teaching departments start focusing on learning rather than on teaching. In the "Age of Information" the traditional teacher will gradually disappear, and teachers will find new roles as "facilitators of learning."

Learning

Learning is a general term for a relatively lasting change in performance caused directly by experience. Learning is also the process or processes whereby such a change is brought about. In education there are a number of taxonomies for classification of learning outcomes. Learning processes may be grouped in six categories; (1) Perceptual motor-skill learning, (2) Associative learning, (3) Learning from analysis and problem solving, (4) Social learning, (5) Learning from symbols and (6) Combined learning. Categories 1-5 are not further discussed in this paper.

Learning is influenced by social factors, cultural factors, technical factors, individual prerequisites, biological factors and psychological factors. We can distinguish between informal and non-systematic learning by socialization, and formal and systematic learning in accordance with formal curricula in schooling. Most of our learning is the result of spontaneous, informal, unconscious learning day after day, week after week and month after month. Only a small part of our knowledge is a direct result of formal education and formal study.

Attention, perception, processing and application are the basis for the mental model of learning that I call "the Learning Helix."

Attention

The learning process starts with attention, such as curiosity, excitement, expectation or fear. In pedagogy this is called motivation. Among the thousands of stimuli in the external context we only see, hear, smell, feel or taste one stimulus at a time. Attention is sudden, direct and distinct. The sequential flow of attention to the parts of a message is determined by the sequence in which information is presented to us.

There are always far more stimuli than we can ever notice at any given situation. Most stimuli remain unknown, unseen and unheard. Attention, or mental preparedness and receptiveness, can be considered as the activation of groups of brain cells that contain previously recorded experiences, knowledge or needs. Paying attention requires mental effort, and we only have a certain capacity.

Frame of Reference

Every day, we are bombarded with information. It is hard to avoid information and just as hard to obtain the information that we really need. It is possible that we miss the information in which we are really interested.

We always have a "frame of reference." New impressions are dependent on and interpreted against the background of our previous experience and learning. Attention is never objective; it is always subjective. We direct our attention to things that move; are large, bold and clear; have bright color, an unusual shape, a good contrast as well as deviate from the surroundings or from familiar patterns. We direct our attention to contents that arouse feelings and needs. This is frequently used in advertising and propaganda in various media. Keates (1982) noted that discriminatory responses to map symbols depend on contrast in form, dimension and color. We direct our attention to what we happen to be interested in at the moment.

Organizing a message can make perception much easier and learning more efficient. The message should have a moderate degree of complexity. However, complexity without order produces confusion, and order without complexity may produce boredom. Inappropriate use of graphical elements may direct learner attention away from essential learning cues, and depress subsequent achievement.

Time Frame

Visual material and a presentation must constantly redraw the attention to hold the interest of the viewer. A presentation holds the viewer's attention when the rhythm, layout and pace are not predictable and boring. For example, when people turn on their TV sets they might not be interested in the program. In Japan TV-viewing habits were recorded for participants in the Hi-OVIS project (Matsushita, 1988). During the first 30 seconds people sometimes switched between 15-20 different channels. Thus, people only spent one to two seconds viewing the TV image and deciding if the program was interesting or not. Viewers do not take the time to actually listen to the sound. Their decisions are based on the pictorial style and contents.

Commissioned by the Director's Guild in honor of its 50th anniversary (1986), the film "Precious Images" was a gift to the American movie audiences. This short consists of a 6.5-minute assemblage of classic moments from 469 favorite movies, past and present. Some moments linger for a few seconds but many are as short as eight frames, averaging 20 frames (less than a second). It is a strange experience to see this film. The carefully chosen images retain their meaning and emotional impact, and trigger your memory.

All cognitive tasks place demands on a pool of limited cognitive resources. When a task imposes a heavy load on the cognitive system, it will in turn interfere with learning by misdirecting attention and limiting remaining resources that are necessary for construction of knowledge (Sweller et al. 1990). Clements (1984) concluded that "the attentional process is relatively diffuse" (page 146). Wickens (1980, 1984, 1991) and Klapp and Netick (1988) have suggested a multiple resource model of attention and processing. Resource models based on individually allocated pools of resources have been developed to explain the effects of structural alteration and time sharing that cannot be effectively explained by other attention models, such as structural theories and capacity theories.

Attention to Pictures

Eye movements supply information on where, for how long and how often subjects actually look at different parts of a picture. Guba et al. (1964), Gould (1973), Nesbit (1981) and Dwyer (1994) all found a positive correlation between eye movements and intelligence. Highly intelligent subjects utilized more fixations than less intelligent subjects. Wolf (1970) discovered that highly intelligent subjects displayed great flexibility in their "scanning patterns," irrespective of the stimuli, whereas subjects with low intelligence tended to display a static scanning pattern that was the same for different stimuli. Nesbit (1981) found a positive correlation between learning and the number of fixations. Dwyer (1994) found that learners with higher IQ fixate more on complex instructional visuals, and that learners with lower IQ have fewer fixations as visual complexity increases. Learners with higher IQs learn more from complex visual displays than learners with lower IQs.

One of the main reasons to use pictures in a magazine, a newspaper or in a book is to draw attention to that specific material. According to Brody (1982) preference for a particular visual format does not necessarily result in increased learning. Yet, in the absence of more substantial data, information based on student preference has a meaningful role to play, in affecting learning from information materials and instructional texts. All other things being equal, we should provide formats that are *preferred by the viewer*, thus making the text more attractive and, hopefully, more motivating.

Vogel et al. (1986) showed that it is undeniable that visual presentation support is persuasive. Presentations using visual aids were 43 percent more persuasive than unaided presentations.

Even when color is not adding any important information to the visual it may still contribute to better learning because the interest for the picture increases, and learners pay attention to the picture. There are many ways to use colors to get attention to certain information. An effective, systematic, color code in a learning material assists the learner in organizing and categorizing stimuli into meaningful patterns.

Perception

Sensory organs jointly constitute a perceptual system that, in a natural environment, collects an enormous amount of superfluous information. We are often unaware of the sensory channel(s) supplying us with information. We are merely aware of the external events.

We are capable of successfully hearing and seeing at the same time. We are also capable of simultaneously hearing different stimuli in either ear. However, we are incapable of simultaneously perceiving different stimuli aimed at the right and left eye, respectively. However, a stimulus may easily be perceived in different ways at different times.

The Perception Process

The concept "perception" is a collective designation for the processes in which an organism obtains information on the outside world. Perception is the organizing and analyzing of the information that we pay attention to. We unconsciously make a constant effort to create some semblance of order in the impulses. We rely on our senses to provide us with data about the outside world. Points, lines, areas, symbols, colors, tones, noise, heat, cold, touch, pressure, sound, visuals and text are integrated in such a way that they can be interpreted as a meaningful whole. We rely on our experiences, thoughts and values to interpret, understand and create meaning from what we see, hear, taste, touch and smell.

In the torrent of information that bombards us, we have to select the information we want. Stern and Robinson (1994) see "selection" of sensory data as the first step of perception. However, "selection of data" may also be seen as a part of "attention." When we attend to something, we select that information for further processing. In view of our limited capacity for handling simultaneous information, it is important to find out which factors determine the parts of the available information that will be processed. Which stimuli do we select and why? When we first look at a visual, we only see what is necessary to perceive and identify objects and events in a reasonable and meaningful manner. This is Gibson's "principle of economy" (Gibson, 1966).

Attention
Perception

Perception. We perceive (black line) the information we have payed attention to (dot). Perception is an internal mental process that is rather fast.

The perception process is often assumed to consist of two stages or levels. Information processing is tentative, fast, rough and parallel in the first stage. It comprises all kinds of analysis, from physiological to cognitive processes. A number of different properties of a stimulus are identified simultaneously. In many instances, one analysis is sufficient. The second stage of the information analysis is conscious, demands attention as well as is detailed and sequential. Various hypotheses about a stimulus are weighed against one another, and are tested. Information processing is more definite at this level.

Fleming and Levie (1978) noted over 50 principles, and Winn (1993) listed more than 75 principles related to perception. While intended for the instructional designer, these principles are also useful to the individual learners. The goal for these lists of principles is to create better and more accurate perception, avoid misperceptions, and help instructional designers to create different kinds of message.

Perception is subjective, and varies as a result of a number of factors, like the learner's current cultural and social status as well as the time and stage of his or her development, mood, experience, imagery and memory. This sets a "frame of reference" for the perception process. Some of our sensory impressions give rise to "garbage" and some to learning.

Individuals differ in the ways in which they perceive any given stimulus. Human perception is only sensitive to changes in stimulation. We actually perceive less than all we see and hear, and much information is never used. At the same time we perceive more than we see and hear. We believe that we see and hear things that are not there. Our brains fill in missing information. Accurate identification can be made from the correct perception of just a few parts.

The perception system strives to obtain clarity. If the system arrives at clarity, then clarity serves as a reinforcement, a reward. So our perception of a text or an image depends on, for example, our previous experience, our mood, other pictures, texts and sound as well as our personal interests. When we look at a visual, we also "see" different details in the visual on different occasions. So, a highly "saturated" information-packed message, like a picture, may have something new to offer even after having been viewed many times.

Perception "Laws"

A number of psychologists view our attempts to establish order as an innate faculty carried out in accordance with certain "laws."

Figure/ground. The contrast provided between the positive elements (figure) and the surrounding and negative space (ground or background) allows visual images to be recognized. This is the "theory of figure/ground." The context in which a visual message is presented has a major impact on the way the message is perceived. For example, the context may consist of text, speech, music, sound effects or other visuals. Our attention is on either the sound or on the image when we view a film or a TV program. This is even more obvious when we look at a multi-image slide and film presentation. As soon as the film starts, our attention is directed towards the movement in the film from the surrounding stills. It is just impossible for viewers not to be influenced by the movement.

Similarity. According to the "theory of similarity" or the "similarity law," we tend to group impressions on the basis of their similarity. Objects sharing similar characteristics such as color, shape, or size belong together. One black sheep in a flock of white sheep tends to be noticed. This can be used for emphasis of a message.

Proximity. According to the "proximity law," we group objects and events on the basis of their proximity to one another. Objects near each other belong together. The eye tends to be attracted to groups or clusters rather than to isolates. Perception is organized.

Continuity. According to the "continuity law" or "theory of direction," we perceive a slow and gradual change in a stimulus as a single stimulus. Lines moving in the same direction belong together. Events that have a natural relationship to one another also give the impression of being continuous. Straight or curved lines tend to lead the eye along, and even beyond, the line. An arrow or a finger pointed at something leads your eye to it. Perception is selective.

Closure. According to the "theory of closure" or the "natural law," various stimuli form meaningful patterns. If a figure is incomplete, our minds will fill in the missing part. For instance, letters printed with damaged or broken type are typically seen as a whole. A single dot on a paper has strong visual power to attract the eye. Two or more dots connect, and create the illusion of lines and areas. Perception is influenced by expectations. When we look at a picture, we first discover the cues we already know. Once we have identified a few well-known shapes, we sometimes feel that we have "seen everything" and could well miss valuable information.

Common fate. According to the "common fate law," objects grouped in a particular way will be expected to change in conformance to this grouping. When change does not follow this pattern, the change is difficult to process.

Objective set. According to the "objective set law" some states are perceived more strongly than others. For example, two lines that almost form a right angle are perceived as a right angle.

Contrast. According to the "contrast law," we tend to array impressions that form natural opposites, thereby reinforcing one another, in groups. Usually there is a constancy of size, shape, color and contrast in the perception of known objects. This is regardless of distance, angle and illumination.

Previous experience. New impressions are dependent on and interpreted against the background of our previous experience. Our assessments change over time and affect our way of associating. We sometimes perceive only what we want to perceive. It is easy to jump to the wrong conclusions. Messages that are contradictory often create more confusion than they provide help.

Processing

Linsday and Norman (1977) have stated that in the teaching-learning environment, "the problem in learning new information is not getting information into memory; it is making sure that it will be found later when it is needed" (page 337). One thing that is common to all the phases of the analysis performed on incoming information is the need to store the signals for varying lengths of time so that information processing can be carried out. In psychological terms the processes that carry out this information storage are referred to as "memories."

Processing
Memory

Processing. We process information (black line) that we have attended to (dot) and perceived (grey line) into knowledge. This process is influenced by our earlier experiences and memories.

The Brain

The modern era of brain research began in the mid-1960s, when Dr. Roger Sperry and his associates published their findings regarding patients who were operated on to control life-threatening epileptic seizures (see Gazzaniga and Le Doux, 1978; Wilson, Reeves and Gazzaniga, 1982; and Sinatra, 1986, for reviews). According to some theories, the two halves of the brain are apparently specialized, and function independently of one another. At the same time, however, either of the brain halves appears to be capable of assuming the functions of the other half. There is an immense communication between the two halves of the brain. It has been estimated at six billion pulses per second.

Each half of the brain has its own sensory perceptions, thoughts, feelings and memories. Thus, the left half of the brain is said to be mainly verbal: capable of speech, counting and writing. The left half of the brain seems to be specialized in abstract thought; it is analytical, logical, detailed and sequential. The right half of the brain is said to be speechless but it is capable of concrete thought, perception of space, and can understand complicated relationships. The right half of the brain is also said to be holistic, spatial, intuitive and creative. Most certainly there is a lot of cooperation between the two brain hemispheres. Generally speaking, dual processing modes of the hemispheres are beneficial to the human being.

During processing of information new groups of brain cells are activated and associate to each other. Old and new information is processed in an attempt to find possible relationships or gestalts. Information is gradually converted into experience and insight. Experience and insight are then converted into knowledge. Later, knowledge is converted into skills and attitudes, and eventually into wisdom. The knowledge acquires more detail and is internalized. This process is influenced by our earlier experiences and memories (internal context).

The brain has 100 billion brain cells (neurons) and 900 billion supporting glia cells. Each neuron may be connected to other brain cells via more than 20,000 structures called synapses (Dryden and Vos, 1994). The brain cells communicate with each other by transmitting electrical impulses through this gigantic network, which is constantly changed and adopted to new situations. The brain is sometimes described as a living jungle, far more advanced than any machine ever developed. However, the "cognitive science" approach compares the human mind with computers. Cognitive scientists generally model the human memory as a very complex network, where each piece of data is cross-linked, or cross-indexed, to many other pieces of data in many different places. Computers and computer networks are now being built to mimic this complicated arrangement.

Processing of Text

The average person speaks about 135 words per minute (Judson, 1972) and the fastest professional TV or radio announcers speak about 150-160 words per minute. Our top reading speed is some 720 words per minute (Lawson, 1968). Text, spoken and written, is always linear and must be processed sequentially, word by word. In printed text we learn from static lines that are dictated by the technology of the printing press. We learn to sequence information, and as a consequence to think in linear, sequential ways. According to Perfetti (1977) and Sinatra (1986), perception of linear representations, such as text, means a sequential, slow processing to compose and comprehend the contents ("left brain activity"). Retrieval from verbal memory is a serial integration and sequential processing of auditory-motor perception systems (Sinatra, 1986).

Western societies have long placed a premium on the properties represented by a well-developed left half of the brain. The design of intelligence tests is usually such that residents of urban areas consistently record higher scores on the tests than residents of rural areas; middle-class people record higher scores than blue-collar workers and whites record higher scores than blacks. However, one study showed that Australian aborigines were dramatically superior to white Australians in solving test problems when these problems were designed so that the right half of the brain had to be brought into play in order to solve the problems. So, intelligence is linked to culture and cannot be defined with numerical values.

For boys, the right half of the brain is said to be more developed than the left half of the brain. With girls it is the opposite. At school children usually receive a good training of the left part of the brain. After a few years boys catch up with girls with respect to the development of the left half of the brain, and remain superior with respect to the right half of the brain.

All children should be able to develop both parts of their brains at school. More right-brain activities like drawing, handiwork, and rhythm exercises are needed. It is conceivable that some of the fantastic success noted by the Japanese in the field of electronics and computer technology is due to the circumstance that the Japanese, since time immemorial, have lived in a "pictographic" society and therefore think differently than we do in Western cultures.

Processing of Visuals

It takes a long time to convey a verbal message. Non-verbal information, however, seems to be processed very fast. It only took a few seconds for adult subjects to recognize "two birds" when shown a picture of two flying House Martins (Pettersson, 1989, 1993). Learning from images is different from learning from text. In order to comprehend visuals, we must be able to process images simultaneously; we must process them in a parallel fashion.

We have to learn to read and comprehend the contents of an image. According to Salomon (1979), the process of extracting information from messages that are presented in any symbolic format involves mental activities. In order to make a match between the symbols and their referents in the learner's cognitive schemata, translation activities are needed. Such processes differ as a function of the symbolic systems used to convey the message. According to Gazzaniga (1967) and Sperry (1973, 1982), perception of two- or three-dimensional representations means a parallel, simultaneous, holistic and fast processing ("right brain activity"). Lodding (1983) concluded that the image memory and processing capabilities of the human mind are extremely powerful. Pirozzolo and Rayner (1979) suggested that word identification is a multi-stage process. Visual-featural analysis is carried out by the right brain hemisphere. Word naming and word meaning are processed by the left hemisphere. According to Sinatra (1986), the meaning of well-known phrase units may be accomplished without activating the auditory-motor speech system. This is said to be done by rapid interchange of information between the language center in the left hemisphere and its non-verbal representation in the right hemisphere.

Norman and Rumelhart (1975, page 17) state that "The fact that a person 'perceives images' when recalling perceptual experiences from memory does not mean that information is stored within memory in that way. It only implies that they are processed as images." Pylyshyn (1973) argues that pictures cannot be stored as complete point-to-point representations, because both the processing and the storage for each picture would be enormous, and therefore overload both the sensory system and the brain.

Using visuals to complement texts is an effective rehearsal strategy in facilitating learners achievement (Dwyer, 1978, 1985). Visual rehearsal allows the learner to process information simultaneously on several levels. The amount of rehearsal activity provided to students significantly influence the performance of students identified as external locus of control (Dwyer, 1994). Pictorial representation of information has a tendency to reduce learner dependence on verbal comprehension skills.

Sensory Memory

There are many models seeking to explain the function of our memories (see Sinatra, 1986; and Levie, 1987, for reviews). One way of viewing memory functions is based on information processing in several steps. The first of these steps is the sensory memory, which carries out the storage of stimulus information at the peripheral level. Hearing a sentence, a word, or even a syllable requires the listener to integrate a changing pattern of auditory stimulation. This integration demands some form of temporary buffer storage, and it is fairly certain that perception relies heavily on such temporary memory stores.

Another example of the sensory memory is the biochemical processes in the eye. There, the visual cells possess some inertia and therefore function as a kind of memory. The sensory memory normally stores information for half a second to one second (vision).

Loftus, Shimamura and Johnson (1985) showed that for one tenth of a second as much information can be extracted from this sensory memory icon as from the picture itself. The iconic memory (vision) and the econic memory (hearing) are closely related to the sensory memory. These memories precede the integration of signals from various sensory systems.

Short-Term Memory

After being processed in the iconic and econic memories, some information is passed on to the short-term (or operative) memory (STM) where it is only retained for a brief period of time, that is, not more than one to two seconds. A number of complex operations are carried out here during solution of problems. But the short-term memory has severe capacity limitations. It is limited in storage capacity: most people can repeat a seven- or eight-digit telephone number, but not ten or eleven digits.

Any information to be retained in this memory must be repeated every few seconds, otherwise it will be lost. Putting new information in short-term memory pushes out the information that is already there.

Information that has entered the short-term memory can proceed through a filter (reception) that selects the information to be passed on. Once this filtration has taken place and certain information units have been assigned priority over others, these priority units are given access to a P system (register) with a limited memory capacity. This is when a person becomes aware of the stored information. All other non-priority information disappears, normally forever if it is not re-transmitted to the filter when the filter is able to accept the traffic. The filter scrutinizes the information received from the outside world and identifies the specific properties of this information. When the information involves aural signals, the filter notes whether the signal is strong or weak. When visual signals are involved, the signal is scrutinized for information on color, size, any movement etc. Rehearsal strategies are generally used by learners to facilitate cognitive processing of new information. Without such processing there is no later storage.

Long-Term Memory

The information that passes the P system can proceed in different ways. The information can be stored in a long-term memory (LTM). This is what normally happens with the knowledge we do not need for the moment. This long-term memory then sets the rules for the selection filter so that the filter makes selections related to previous experience. Information is processed and remembered in "chunks" that are organized hierarchically. We have to think about and "work" with new information in order to get it into our long-term memory. Learning requires brainwork.

According to Weinstein and Mayer (1986) rehearsal strategies are designed to repeat information while it is in the short-term memory, to compensate for the time and limitations there. The longer an individual can rehearse information, take notes, analyze and interact with texts and visuals in an active way, the greater is the possibility that this information will be moved from the short-term memory to the long-term memory, and the greater the possibility that increase in learning will occur (Murray and Mosberg, 1982).

The long-term memory is what most people mean when they refer to "memory." The long-term memory carries contents, episodic memories (that is, recollections of events, feelings, experiences etc.), words, pictures, concepts etc. The short-term and long-term memories are actually theoretical models that cannot be related to any activity pattern or any particular anatomical structure in the human brain. The distinction made between the STM and LTM is probably too clear-cut.

Information can also be passed on to an "output system", which emits signals to the muscles that are to carry out a given act. The information can be switched back from the P system to the reception or to the short-term memory. The information can also get lost.

Many people, of all ages, have had accidents bringing them close to death, and subsequently described death or near-death experiences they had just before losing consciousness. These experiences often encompass a large number of wide-ranging images of events throughout their lives, flashing past in a rapid, sometimes chaotic succession. They may even recall people, places and events from their earliest years. Buzan (1977) suggested that people may well remember everything that has ever happened to them, but they are normally unable to access this information.

Other Memory Models

According to the cue information theory (Adams and Chambers, 1962), information that is shared between channels facilitates learning. Cues that occur simultaneously in auditory and visual channels are likely to be better recalled than those presented in one channel only. Drew and Grimes (1985) showed that close coordination between audio and video improved audio recall of TV news, and that redundancy aided story understanding.

The dual-code memory model (Paivio, 1971, 1978) proposes a verbal system for processing and storing linguistic information and a separate non-verbal system for spatial information and mental imagery. These systems can function independently, but are also interconnected. Other memory models include a single-code approach. All information is coded as abstract propositions. Complex cognitive processing of information involves the use of both visual and auditory cues.

A number of techniques are available for improving memory. Buzan (1977) discussed special memory systems that establish links between or exaggerate the image of things to be recalled. The mere act of making a special effort to remember may suffice to improve memory capacity. Mnemonics are additional cues to help retrieve the appropriate information. For example, a mnemonic for remembering the order of the colors of the spectrum, red, orange, yellow, green, blue, indigo and violet, uses the sentence "Richard of York gains battles in vain." The color names are first reduced to their initial letter, and these are then elaborated into a meaningful sentence, providing a sequential organization not present in the order of the color names themselves.

According to Kossllyn (1975) more details of a mental image of an object are remembered when the object is imagined next to a smaller object. Thus, the relative size of a part of an image may affect our ability to remember and recognize it.

In conclusion, results from several experiments show that when contents are the same in visual, audio and print channels, learning is maximized. The contents, the structure, the context and the format of a visual influence the viewer's ability to perceive its message.

Forgetting

Forgetting is the process through which information in memory becomes inaccessible, either because the information is no longer stored or because it is stored but is not at that time retrievable. Forgetting is rapid at first and then gradually levels off. This process may be increased by interference from other material, either learned beforehand or subsequently. The amount of forgetting increases with the amount of interfering material and with its similarity to the material being remembered. People tend to remember what they regard as most important; they typically operate by attempting to reconstruct the incident using their existing knowledge, with the result that they may recall what would have been expected rather than what actually occurred.

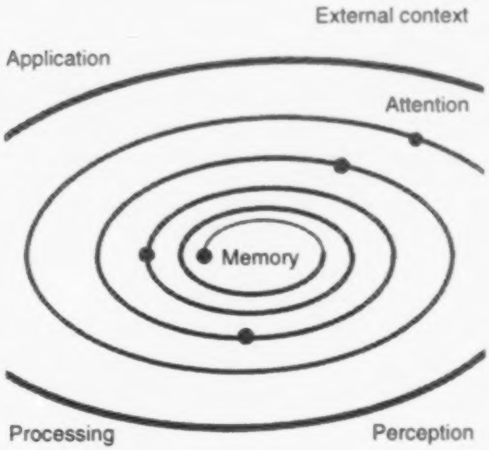
Application

After attention, perception and processing of the information we apply our new knowledge and test it in different applications for confirmation. It is important to use new knowledge. We will remember relevant and meaningful information if we have use for it. The usefulness of conclusions made by other people is limited. We must gain confirmation through our own experiences. The information must be internalized and made our own property as part of our memory.

Memory and experience are successively developed and act as a "cement" in learning. Our previous memory will influence our new learning. This is often very good. Learning in a familiar area is more easy, effective and rapid than learning in any new areas. Good experience of previous successful learning is a very good prerequisite for learning of new material. On the other hand, previous "bad experiences" and failures will often have a negative effect on learning in the same area. We may be afraid of new fiascoes.

Application

Application. After attention, perception and processing of the information (grey) we apply our new knowledge and test it in different applications for confirmation (black lige). Hereby, knowledge is internalized and made our own property.



The Learning Helix. Attention makes us receptive to specific data and information in our environment (external context). We select and perceive information that we process into knowledge with reference to our earlier experiences and memories (internal context). We apply and test for confirmation. Hereby, knowledge is internalized and influences new attention ...

Attention makes us receptive to specific data and information in our environment (external context). We select and perceive information that we process into knowledge with reference to our earlier experiences and memories (internal context). We apply and test for confirmation. Hereby, knowledge is internalized and influences new attention. Different learning processes are active at the same time. Information is processed into knowledge with continuous parallel and spontaneous learning. This is "the Learning Helix."

The learning processes do not always start as a direct result of external impulses or "outside" information. Sometimes an association initiates a conscious process of thought. We may create new knowledge from the experiences and knowledge that we already have. These processes often take place at a subconscious level, and we are not aware of the processes. That is why we suddenly can get good ideas and solutions to problems that we have had for a long time.

It can be concluded that we need to apply and use what we learn. We will remember relevant and meaningful information. Knowledge is internalized, and made our own property as part of our memory.

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Electronic Presentations In The Corporation: How Are They Being Used

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Introduction

Very few facts are known about how electronic presentations are being used in today's business environment. The medium is just too new. The medium is the newest on the presentation scene and electronic presentations have become the fastest growing medium in the presentation industry. The purpose of this study was to measure the impact of the medium on the business presenter and also to serve as a base line study for future analysis of the medium.

Business people are making use of electronic presentations. Of the business people that were participants in this study, 73% reported relying on visuals when they make presentations. They also report giving between 1 to 5 presentations per month. Another remarkable statistic about this test group, one that fuels the growth of electronic presentations, is that 50% of the respondents report either owning or having access to a laptop computer. Business people have the need and the means to make electronic presentations.

Definition Of An Electronic Presentation Used In This Study

For the purpose of this study an electronic presentation was defined as a presentation which made use of:

- a computer (often a laptop design),
- presentation graphics software (i.e. PowerPoint, Harvard Graphics or Freelance)
- a projection device (one of the following devices - overhead projector and a liquid crystal display panel, video projector with computer connections, large screen computer monitor, laptop or desktop computer only).

Of course there are other definitions of an electronic presentation, however, this view gave us a broad interpretation of the medium.

A Brief History Of Electronic Presentations

Growth of the electronic presentation for business presentations has been extraordinary. Not since the growth of the overhead projector in the 1960's has a family of audio visual devices captured the attention of people who make presentations.

But, there are differences in the growth patterns of the two mediums. When the overhead projector exploded on the scene its impact was felt most strongly by educational institutions, primary and secondary schools and colleges. And while educational institutions have shared in the growth of electronic presentations, the high costs involved are often too much of a burden for educational institutions. This medium has had it's biggest impact to date in business; business people are making electronic presentations.

How The Study Was Conducted

A questionnaire was sent to 506 subjects. A complete listing of the questions and results of the study are shown in Figure 8 at the end of this paper. The subjects were randomly selected from the mailing list of the Private Industry Council of Central Pennsylvania, a training and development consortium located in State College, Pennsylvania. This consortium provides guidance to businesses in the Central Pennsylvania region. All of the subjects contacted were somehow associated with the business community.

A total of 201 questionnaires were returned by the due date stated on the questionnaire. This was a 40% return rate.

A generalized profile of the respondents indicates that they came from diverse types of companies with diverse company size. Many industries were represented. The subjects were 59% male and 40% female with 1% not determined. The average age of the respondents was from 36 to 45 years old. This mixture of subjects provided a strong pool for the study.

Results Of The Study

The results that were derived from the study fall roughly into two major categories: those results derived from all of the respondents and those results derived from the sub category of respondents that were engaged in making electronic presentations.

Results From All Respondents

Three major results were discovered when we looked at all of the respondents in the study. First, 27% of the respondents reported giving at least one electronic presentation. Interestingly, several of the respondents reported that they had given electronic presentations in previous jobs with other companies, but could not give electronic presentations now because their employers did not have electronic presentation equipment.

Another interesting result derived from all of the respondents in the study was their ranking of their preference for various audio visual devices. As a group their preferred devices, in rank order, were as follows:

1. overhead projector
2. flip chart
3. electronic presentation
4. slide projector

As a group they did not consider the electronic presentation to be very high on the presentation list. This ranking is important when it is compared to the group of respondents who use electronic presentations.

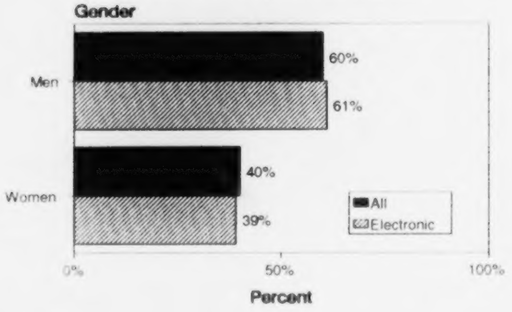
Results From Respondents That Used Electronic Presentations

To determine the impact that electronic presentations have had on business presentations, we separated out those respondents that reported experience in giving electronic presentations. Subjects that fell into this group accounted for 27% (54 subjects) of the total subject pool. We have classified the responses from this group into three categories: presenter-oriented, hardware /software-oriented, or audience-oriented responses.

Presenter-Oriented Responses

In this category we gathered responses from presenters that told us something about the people who give electronic presentations. In this paper we will display our results using bar graphs. Whenever possible this data will show information for all respondents (under the heading All) and for those that used the electronic medium (under the heading Electronic). For example, we found that an almost equal number of men and women give electronic presentations. Figure 1 shows the percent of males and females who use the medium.

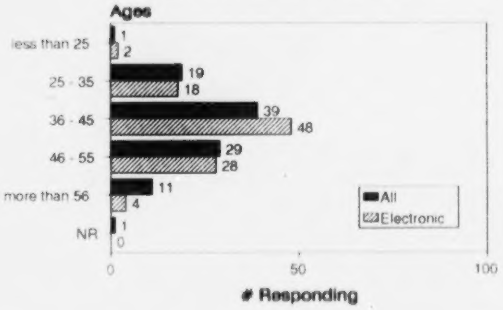
Figure 1
Gender of People Surveyed



There seems to be no gender bias in who gives electronic presentations. The minor difference between the genders is not significant.

While gender bias does not exist, use does appear to be determined somewhat by age. Use by age can be seen in Figure 2.

Figure 2
Age Of People Surveyed



What is apparent when you look at Figure 2 is that the 36-45 age group accounts for the greatest number of the electronic presentations. But, what is interesting when you analyze Figure 2, is that a large percentage of people in the 46-55 group and the older than 56 group give electronic presentations. There are several reasons that may explain this phenomenon. First, older business people often are in a better position within a business enterprise to give presentations. Because of age and experience, men and women over the age of 46 usually give the corporate world's presentations. A second reason for the age phenomenon to occur is that older people are more likely to have access to electronic presentation equipment within the organization. The older, experienced people seem to be able to locate and make arrangements to use the corporations electronic presentation equipment. A third reason that can. be offered is that older presenters are possibly more able to take presentation risks than younger people in the organization. As will be talked about later in this paper, giving an electronic presentation continues to be a riskier situation than the more conventional presentation. The possibility of presentation failure looms large.

It is interesting to compare the electronic presenters to all respondents. When the electronic presentation group was asked to rank their preference for audio visual devices, their list was as follows:

1. overhead projector
2. electronic presentation
3. flip chart
4. slide projector

The difference between the two groups is in the shift between the electronic presentation and flip chart. Electronic presenters rank electronic presentations ahead of flip charts while all respondents reverse the order. What is startling about this ranking is that even electronic presentation presenters rank the overhead projector first. The reason for this may be based on the fear factor with electronic presentations. A salesman for video projectors reported to us during our early work on this research that he still sees many potential customers that will not consider using electronic presentations because too much can go wrong with them. The salesman referred to the problem as the "fear factor". Obviously electronic presentation manufacturers and potential customers will have to work together to reduce this presentation fear.

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Respondents were also given an opportunity to give open ended comments about electronic presentations. Some positive reasons given by presenters for giving electronic presentations were:

- electronic presentations are sent to us from headquarters and we use them
- animation can be used on the medium

They also offered some reasons for caution about the medium.

- you can't always depend on electronics
- can't count on it in hotels...you've got to carry your own gear

The researchers also found some misguided reason for using electronic presentations. We refer to these reasons as misguided because they can not be supported in the research literature. These reasons are:

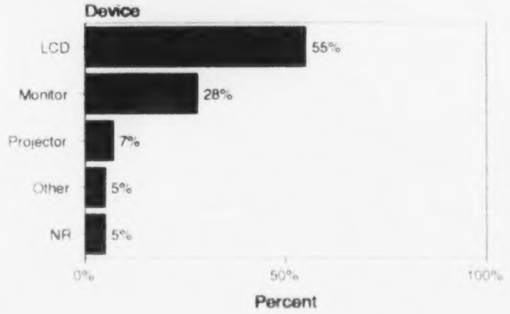
- electronic presentations give (you choose the word...impressive, professional, effective, efficient, vivid, clearer, sexy) presentations
- electronic presentations make it easy to present large amounts of numerical data
- audiences want electronic presentations
- you can personalize electronic presentations
- it's easy to make word lists

These reasons will be discussed further in the implications section of this paper.

Hardware-Oriented Responses

Responses about choices of electronic presentation hardware were also revealing. Figure 3 indicates the type of equipment that is most often used to display the output of the electronic presentation.

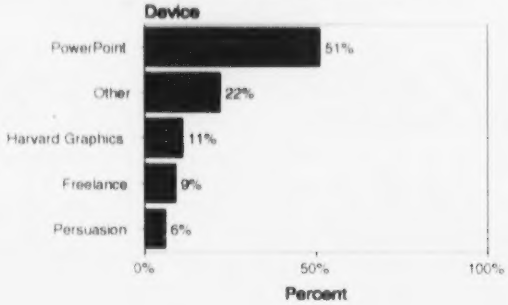
Figure 3
What Device Do You Use To Display Your Electronic Presentation



As the data indicates, a liquid crystal display (LCD) seated on top of an overhead projector is the most common display device. We wondered how many of the LCD panels were used on overhead projectors with inadequate lumen output. Low light output overhead projectors are a major problem in electronic presentation display. Monitors were the second most popular display device.

Another tool of the electronic presentation is software. The questionnaire listed the most popular brands of presentation software used in business, but also allowed for an open ended response. The results are shown in Figure 4.

Figure 4
What Software Do you Use To Make Electronic Presentations?

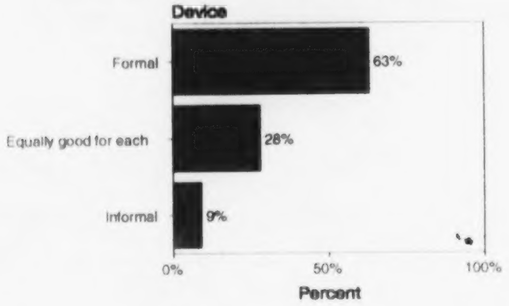


Obviously the Microsoft revolution continues to sweep the electronic presentation marketplace with the overwhelming response for PowerPoint software. PowerPoint software is the most heavily used software for electronic presentations. It is assumed the popularity of this presentation software will continue to grow through the next several years.

Audience-Oriented Responses

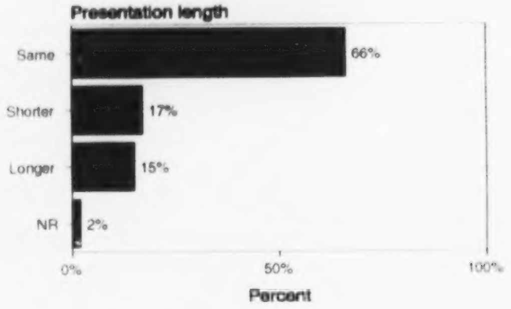
Responses in this category told us about the audience perspective of the electronic presentation. In this area the authors looked at issues relating to type of message, length of message and audience size. For example, Figure 5 shows that most presentations are given in a formal, planned presentation rather than an informal situation.

Figure 5
In What Type Of Presentation Setting Do You Use Electronic Presentations?



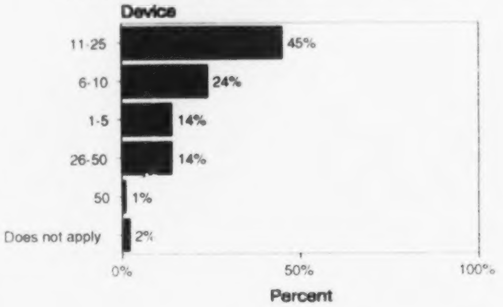
In another area of audience-related response, the authors wondered if electronic presentations lasted longer than presentations given in other mediums. A general perception about the electronic presentation is that they last longer than presentations given with other mediums because there are so many "extras" that come with the electronic medium. Research does not support this fact. Figure 6 indicates that electronic presentations do not seem to be longer or shorter than presentations done in other mediums.

Figure 6
What Is The Length Of Your Electronic Presentation Compared To Other Audio Visual Mediums?



Another area that was investigated was the size of the audience for a typical electronic presentation. Audience size provided a few surprises. Figure 7 shows the size of the typical electronic presentation audience.

Figure 7
To What Size Audience Do You Normally Present Electronic Presentations?



It was surprising to the authors that electronic presentations are given to smaller audiences rather than larger audiences. This is a statistic that will most likely change as display devices move from LCD displays and monitors to video projectors.

Implications

There are six implications that can be derived from this study.

1. Respondents that used electronic presentations felt that they were very effective for delivering a message to an audience. They justify the effectiveness of the medium by citing reasons that are not supported in the research literature.

Judgements about the electronic medium appear to be based on feelings rather than empirical fact There are a wide variety of reasons mentioned for using electronic presentations that are simply erroneous. One respondent said, "using electronic presentations gives me a sexy presentation." As desirable as it may be to give a sexy presentation the medium is not designed to provide this quality. It can be hypothesized people will continue to adopt new media for their own reasons.

2. Overhead transparencies continue to be judged the most effective medium for delivering a message, but electronic presentations are growing in favor.

This finding was surprising to the authors. It appears that while the electronic presentation offers many advantages over older mediums, what a presenter needs more than anything else is dependability. When the presenter turns on the switch he expects something to happen. The electronic presentation has not yet reached that level of dependability. When it does, the overhead projector may be relegated to second place.

3. Video projection is not yet heavily used. Only 7% of the respondents reported using the medium.

How to display electronic presentations has long been the question with the medium. While the liquid crystal display (LCD) is the leading method of display, the major deficiency of the hardware is that the display can not always be paired with a high light output overhead projector. High output overhead projectors used with an LCD must have at least 4000 to 6000 lumens of light output. Many electronic presentations do not suffer from deficient LCD's, but rather from low light output overhead projectors.

Video projectors appear to be the superior device for making electronic presentations. These projectors combine the display device and the properly matched light output in one convenient package. Generally the video projector is a medium weight device that can be purchased for about the same price as the LCD and overhead projector combination.

4. The biggest single weakness cited by the respondents for electronic presentations is that you cannot depend on the various electronic components. Reliability of the equipment must be increased and the fear factor of presenters must be decreased.

This is a major finding of this study and should be heeded by equipment manufacturers and audio visual professionals. If this medium is to reach its true potential, the equipment must be made more reliable, easier to interconnect and simpler to use. The success of this medium will be impeded if users must rely on an army of computer gurus in order to make their presentations work successfully.

5. Microsoft's PowerPoint presentation graphic software dominates the electronic presentation medium. What Microsoft adds to the software will become the standard for the electronic presentation medium.

Microsoft's domination of this segment of the software market can be a problem or a blessing to the electronic presentation marketplace. If Microsoft continues to improve PowerPoint new converts will move to the medium because of features offered by the software. However, if product development of the software stalls, new dimensions of the medium may not be found. New players in the presentation graphic marketplace are not likely to enter rapidly because Microsoft holds a large share of the suite marketplace for software. Few companies have the ability to challenge Microsoft's power.

Conclusion

The electronic presentation is a force to be reckoned with in the world of presentations. The electronic presentation revolution has only begun, but the fate of the medium rests on an unstructured alliance between hardware manufacturers, software developers and end users. The right interaction between these forces is needed to insure that the deployment of the medium is successful.

The authors thank the business people who willingly participated in this study. This report gives us the first true look at how video projectors are being used in presentations. Our thanks to all.

Figure 8
Complete Questionnaire Results

QUESTION	RESPONSE	ALL (N=201)	ELECTRONIC ONLY (N=54)
1. On average, how many presentations (electronic & non-electronic) do you normally give a month?	None	5	23
	1-5	111	36
	6-15	31	12
	16-30	2	1
	31+	4	2
	NR	1	0
2. Do you usually use visuals in your presentation?	Yes	147	9
	No	44	5
	NR	10	0
3. Have you ever given an electronic presentation?	Yes	54	-
	No	139	-
	NR	8	-
4. Of the presentations you give each month, how many are given electronically?	None	139	0
	1	0	19
	2-5	0	16
	6-10	0	4
	10+	0	4
	NR	8	1
5. When you use an electronic presentation what are the reasons that you choose to use them?	open response		
6. To what size audience do you normally present electronic presentations?	1-5 people	-	7
	6-10	-	13
	11-25	-	24
	26-50	-	7
	50+	-	1
	Does not apply	-	2
7. If you at times give electronic presentations & at other times use another medium, are the electronic presentations...	longer	-	8
	shorter	-	9
	about the same	-	36
	NR	-	1
8. For what kind of presentation would you use an electronic presentation?	formal	-	34
	informal	-	5
	equally good	-	15
9. When you use electronic presentations, what software do you normally use to create & present you presentation?	PowerPoint	-	28
	Harvard Graphics	-	6
	Freelance	-	5
	Persuasion	-	3
	Other	-	12

QUESTION	RESPONSE	ALL (N=201)	ELECTRONIC ONLY (N=54)
10. When you use electronic presentations, what type of display do you most commonly use?	video monitor	-	15
	liquid crystal display	-	29
	video projector	-	4
	other	-	3
	NR	-	3
11. Do you own or have access to a laptop computer?	yes	101	42
	no	95	12
	NR	5	0
12. Rank the mediums in terms of their usefulness to you in business presentations.	see paper		
13. What is the size of the company you work for?	<50 employees	73	13
	50-200	46	16
	201-750	34	8
	>751	45	16
	NR	3	1
14. What business sector do you work in?	Multiple responses		
15. What is your gender?	male	120	33
	female	80	21
	NR	1	0
16. What is your age?	<25	3	1
	25-35	38	10
	36-45	78	26
	46-55	59	15
	>56	22	2
	NR	1	0